Shiawassee National Wildlife Refuge

Annual Narrative Report

1966

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United States Department of the Interior

Fish and Wildlife Service

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I. GENERAL

A. Weather Conditions.

	Precipitation				Max.	Min.
	Month	Normal	Snowfall		Temp.	Temp.
January	1.26	1.11	12.5		47	-12
February	.98	1.76	10.3		52	-7
March	1.79	1.28	5.0		73	13
April	2.26	3.35	1.4		75	33
May	1.39	3.08	-		84	25
June	.71	3.89	-		95	34
July	1.14	3.56	-		100	41
August	4.62	2.74	-		92	43
September	2.14	2.39	-		89	35
October	1.17	3.54	T		81	18
November	4.07	3.93	17.8		60	18
December	2.11	1.75	11.9		64	1
Annual Totals	23.63	32.38	58.9	Extremes	100	-12

The winter weather conditions in the Saginaw Valley were similiar to 1965 with near normal temperatures and below normal precipitation Alternating freezing and thawing occurred throughout January, February, and March and snow cover disappeared with no appreciable run-off. There was no flood threat to the refuge area in the spring of 1966.

Precipitation received was well below normal throughout the summer months with serious drought conditions prevailing during most of the growing season. At the end of July total precipitation was 52 per cent of normal and this was reflected in generally poor yields from farm crops.

Precipitation was near normal during the remainder of the year. The First measureable snowfall was received on November 1 when ten inches fell with near blizzard conditions. This was followed by a warming trend and the ground was free of snow within a week. The latter part of November was warm and rainy until winter returned with another blizzard type snow storm on the 30th.

December conditions were normal for the Saginaw Valley. Periodic rain, sleet and snow, and combinations of all three, was received making travel somewhat uncertain at any time during the month. There is five inches of snow on the ground at the close of the year.

B. Habitat Conditions.

1. Water. Run-off from snow melt was gradual as a result of alternating freezing and thawing conditions all winter. There was no real flood threat during 1966. Water levels in the pools were nearly ideal for the spring migration and goose nesting season. Snow melt did cause a rise in Pool 1 elevations to a point where high winds caused severe wave erosion to Pool 1b nesting islands and to the low level dike, already in poor shape because of flood damage in 1964. It was necessary to draw down levels in Pool 1b on April 29 to reduce erosion damage to islands with active goose nests.

It had been planned to draw Pool 1a down for habitat improvement work in 1966, and when flood damage funds became available it was decided to also drain Pool 1b so that necessary repairs to the low level dike and nesting islands could be completed. Dewatering was started on May 5, after most goose nests were hatching, and both pools were dry by June 2. As soon as the repair work was completed and the dike and islands were seeded, pumping was commenced on July 5 and Pool 1b was at approved elevations again by July 28.

Habitat improvement work was completed in Pool 1a and refilling started on August 22. Levels were raised in steps until approved overwinter elevation was reached on October 29.

Pool 2 was flooded all summer. The pump installation performed well but several leaks in the old dikes made it difficult to maintain desired levels and cattail again invaded this marsh.

In general, water conditions were excellent on refuge impoundments throughout most of the year. Higher levels in the Great Lakes in 1966 were reflected in the Shiawassee River marshes which had water most of the summer for the first time since 1961.

2. Food and Cover.

Food and cover was generally unrestricted and readily available to all wildlife species during the year. Spring migrants fed exclusively on flooded corn fields where the refuge share of the crop had been knocked down over the winter. Natural foods were utilized more and more as the marshes opened up in April.

There was an abundance of natural foods available in the pools during the summer and cover conditions were ideal. The nesting goose flock, and the years production of goslings, again fed primarily on new growth of farm crops in Farm Unit 121 during most of the summer, and moved into the pool as natural food matured.

With the pool draw-down and reflooding, an excellent crop of smartweed was produced and made available as water levels were raised progressively. This was heavily utilized by the ducks, especially mallards and black ducks. Feeding flights to harvested grain fields increased as the harvest progression increased until the major waterfowl feeding activity occurred in harvested fields during October and November.

Mallards, black ducks, Canada geese and blue and snow geese completely utilized winter wheat and barly fields that were unharvested and later chopped down with the rotary mower.

Canada geese again fed consistently on sugar beets during October and November. Winter wheat was also heavily grazed by geese in the late fall months. Duck feeding activity was confined mainly to barley, wheat and corn, but ducks fed heavily on soybeans for a period during November.

The major portion of the refuge share of the corn crop was again left standing to be knocked down during the winter to provide food for spring migrants.

II. WILDLIFE

A. Migratory Birds.

Whistling Swans. The first migrant Whistling swans were observed March 13 when a group of 29 were counted. Later in the day 112 birds were observed on Farm Unit 121b feeding in flooded corn. On March 14, 600 swans were observed in Pool 1b. Upon arrival the majority of the birds used private flooded cropland adjacent to the south boundary of the refuge. By March 20, after dewatering of this cropland, the swans used the flooded cropland in Farm Unit 121 and 122. A peak population of 2500 birds was reached on April 3. A very small segment of this population were immatures. By April 4 only 50 swans remained on the refuge. On April 9, 150 swans moved into the refuge. This group was made up primarily of immature birds. The same afternoon these birds moved on and the population remained at 10 until about May 1.

The fall migration of swans was noted on November 2, with the arrival of 32 birds, about half of which were immature. This total increased abruptly to a peak of 350 on November 9. By the following week only 15 birds were observed, most of these having been trapped and released on November 9. As these birds gained strength they too began to leave throughout late November.

The majority of the fall activity was confined to loafing in Pool 1 with occasionally small groups or single swans feeding on Farm Units 121 and 122. The total swan use days for 1966 was 40,231.

A swan injured in 1965 and released into Pool 1 is still present on the refuge. In addition, another injured swan was released into Pool 1 on November 16. This bird is also still with us. Further information on Whistling Swans is reported in Section V under Shiawassee Study Project No. 2.

Geese. The year started out with a total of 2000 Canada geese using the refuge. This number remained until the week of January 23 when the first sub-zero temperatures of the year occurred. The first migrant geese were noted when a group of fifty birds were observed on March 2 in the Shiawassee River and Farm Unit 121a. The population increased rapidly to 6000 by March 5. A peak spring population of 15,000 was reached the last few days of March. The majority of the migrant birds moved out in mid-April after which only the 500 birds of the resident flock remained on the area. A group of five Blue and Snow geese were observed on April 20. No other observations of Blue and Snow geese were made during the spring migration.

Nesting activity was first observed the third week in March. Damage to nesting islands by wind and water reduced available nesting sites but nesting activity was generally carried out without interuption. Nesting surveys were conducted during early April. A total of 39 nests were located with a gosling production of 193 in 1966 in comparison with 28 nests and a production of 115 young in 1965. On June 16, 154 goslings were trapped and banded by refuge personnel. A white plastic leg band with a green strip served to identify the birds as 1966 goslings. Further nesting and production information is included in Section V, Shiawassee Study Project No. 1.

The first fall migrant Canada geese appeared around the third week of September bringing the refuge total to 1100 birds. During the first week in October the number of birds was 5000. A peak of 18,300 birds was reached October 27. The first Blue geese were observed October 6 and the first Snow geese on October 7. A peak of 300 Blue and Snow geese was reached by the end of October. Geese started to leave the first week of November but there was an average of 9000 through November and nearly 4000 through December. To date nearly 4000 Canada geese are still present on the refuge.

The total goose use days for 1966 was 1,408,078. This represents an increase of 33 per cent over the 1965 total of 1,055,110 goose use days. The majority of this increase took place in the fall. Fall use in 1966 totaled 807,737 use days while that of 1965 was 608,300 use days. This total reflects the new record peak population of 18,300 and the extended use of the refuge by large numbers of birds through December.

Migrant geese utilized chopped spring wheat and barley early in the fall. Utilization of sugar beets and winter wheat also took place. Following the harvest of soybeans significant use was made of waste beans by the geese. As usual extensive feeding on corn occurred.

1966 was the third year of a three year closure to goose hunting on a large block of land surrounding the refuge. A new record fall peak of 18,300 Canada geese was recorded. This compares to a peak of 7,500 in 1964, and 12,000 in 1965, the first and second years respectively, that the area was closed to goose hunting. In 1963 the area was open to hunting and heavy hunting pressure resulted along the refuge perimeter. The 1963 fall peak was 3,500. 1967 will see a reopening of the closed area.

Ducks. A few mallards and black ducks were present the entire winter. The spring migration was under way on March 2 when observations of mallards and black ducks were recorded. Pintails were seen on March 3; Ring-necked ducks, Baldpates, Redheads, Common Merganser, and Wood ducks on March 7, Goldeneye on March 9, Lesser Scaup on March 10, Canvasback and Shoveler on March 13, Green-winged teal on March 16, Blue-winged teal and Bufflehead on March 28. The peak spring population of 16,700 was recorded during the week of March 27. The majority of the migrants had pulled out by April 17 and the refuge summer breeding population had stabilized at about 500 birds by the first week in May.

The first broods were seen on May 25. No brood counts were made other than random observations during the summer. Estimated total production of ducks was 750.

Duck populations began to increase during the second week of August with 6000 birds present by the end of August and 7500 by the first of September.

Indicative of the fall migration were increases in numbers of mallards and blacks and the first arrival observations of the following species: Baldpates on September 7, Ruddy ducks on September 21, Redheads and Pintails on September 30, Lesser Scaup on October 4, Ring-necked duck on October 6, Shovelers on October 7, Canvasback on October 20, and Common Goldeneye and Buffleheads on October 28. A steady increase of birds was observed into October with a peak of 41,420 reached during the first week of November. Mallards and black ducks comprised the majority of this peak. A rapid decrease in numbers occurred during the end of November and the first of December. Of note was the increased numbers of green-winged teal in October and the presence of wood ducks into November. At the end of the year about 1200 mallards and blacks remain on the area.

Duck use days for 1966 totaled 3,080,959 representing an increase of 37 per cent over the 1965 total of 2,258,412. Spring use days were up 75 per cent over the 1965 figures. Summer and fall use increased 30 per cent over the 1965 total. This increase reflects the greater numbers of ducks using the refuge over an extended period.

Major feeding activities of ducks during the early summer were on natural foods in the pools. For management purposes Pool 1 was drawn down during the summer. As a result of exposure and soil disturbance, rich stands of wild millet and smartweed appeared. Reflooded pools produced good areas for feeding ducks and were heavily utilized during the fall. As harvesting operations began feeding on agricultural crops increased. Barley, wheat and corn received preference but moderate feeding on soybeans was also observed following the harvest. Feeding flights to the Shiawassee Flats State Game Area were quite common until slacking off with the opening of the hunting season, and increased hunting pressure. In November feeding flights of mallards and blacks made good use of harvested fields on the Big Prairie Farm and adjacent private lands to the southeast of the refuge.

Coots and Gallinules. The sighting of 3 coot on March 13 signaled their arrival to the refuge. A peak of 300 birds was reached the week of March 27 and remained until stabilizing at a breeding population of about 50 the second week in May. Production was believed to be below normal, a reflection of the smaller breeding population. A peak of 600 was recorded on October 27. After a three week period numbers declined rapidly and the last coot observed was recorded on December 2.

Common Gallinules were first observed on April 17. The summer population appeared to be down in comparison to previous years with a corresponding decrease in production. The last observation of gallinules was recorded in October.

Other Water Birds. First arrival observations of the various species were scattered over a two month period beginning with a Great Blue Heron on March 26 and followed by Pied-billed Grebes on March 29, Green Heron on April 29, and Black-crowned Night Heron on May 2. All common species were present by the end of May. Populations of the various species were estimated to be about normal. Nesting colonies of Great Blue Herons and Green Herons were again active at the usual locations. American Egrets were summer visitors with 5 being observed in August and early September. The first refuge observation of a Snowy Egret was recorded during the first week in August. Last observations of most of the marsh and water birds were recorded in October. Great Blue Herons were still present into late December.

Shorebirds, Gulls and Terns. Recorded spring arrival dates were as follows: Herring Gull and Ring-billed Gull in March, Killdeer on March 17, Spotted Sandpiper on April 22, Yellow-legs on April 29, and Black Tern on May 4. All common species were present by early summer. No unusual observations were made. Essentially, all species had departed by the end of November with the exception of gulls, a few hundred of which were still present at the end of the period. In general, shore bird populations appeared to be about normal.

B. Upland Game Birds.

The Ring-necked pheasant population was observed to be about the same as in 1965. Periodic observations were made throughout the year, most frequently near the dense willow and brush along the riverside dike north of Farm Unit 121 and 122. Broods were not uncommonly observed in the summer. An estimated total of 100 birds were using the refuge at the end of the period with a sex ratio of 1:5. The pheasant population as a whole has been on the decrease in the Saginaw County area and is presumed to be a result of modern clean and efficient farming methods.

Mourning doves were common throughout the year. Banding operations were initiated during late summer and early fall with 40 birds trapped and banded.

C. Big Game Animals.

White-tailed deer were commonly observed throughout the year. On February 22 a ground census was made and 337 deer were observed using Farm Units 152, 121a and 121b. Feeding activities were primarily in corn, wheat, and barley stubble fields in which a clover cover crop was present. Production figures are unavailable but observations indicate it was normal with twins and triplets more common than single fawns. The peak population prior to hunting season was estimated to be at 500 with a sex ratio of 1:10. At the end of the hunting season the majority of the deer herd had concentrated in the closed area (Farm Units 121 and 122). This total was estimated from general observations at about 300.

During the hunting season an estimated removal of 40 per cent of the deer herd occurred. This represented 150 legal deer taken along with about 50 illegal deer. It has been observed that an excessive deer population may result in competition for food with waterfowl. It appears that the 40 per cent reduction will minimize competition with waterfowl while insuring enough breeding stock to produce a huntable surplus for the 1967 season.

D. Fur Animals, Predators, Rodents, and Other Mammals.

Stable muskrat populations were observed through 1966. Dewatering of Pool 1 in the summer may have been responsible for a decrease in muskrat activity in this area, however a corresponding increase in muskrat activity was noted in Pool 2. Many dens were observed in the dikes but damage was at a minimum. The current population is estimated at 2000 animals. Trapping operations currently underway will alleviate potential dike damage while insuring a breeding stock to maintain the population at a desirable level. Muskrat activity has and should continue to provide a valuable service in breaking up dense stands of cattail creating better waterfowl habitat.

The beaver population, estimated at 50 animals, remained active as indicated by tree felling and lodge construction. At the present time such activity has been considered beneficial in that undesirable cottonwood trees and willows are being removed from the dikes and ditch banks near their houses. Occasional mis-felling of trees results in slight inconveniences when vehicle traffic along the dikes has been blocked. A controlled harvest of beaver may become necessary if beaver populations and related activities become destructive.

Mink and weasel populations remained low. No observations of either species were made during the year.

Raccoons were approximately equal in number to last year. No data concerning raccoon predation on waterfowl nesting is available but banding operations were hindered by frequent visits of raccoons to trap sites. Six raccoons were taken during a period of two weeks after which banding operations continued without interference from these animals.

Three active red fox dens were observed along the center dike near a ditch, on Farm Unit 121, near the goose pen. Frequent observations of these animals were made throughout the year. Fox were seen attempting to take individuals in flocks of feeding geese and ducks. It is believed they met with little success, however a fox was noted chewing on a goose carcass. Concerning several swans which had died and the carcasses found partially eaten, it was presumed to be the work of foxes. In general the role of fox on the refuge appears to be in removal of sick and injured birds from refuge waterfowl populations.

Infrequent observations of striped skunks were made this period.

Periodic observations of woodchuck and fox squirrels were made during the year. Cottontail rabbit signs was noted on the northeast corner of the refuge but few sight observations were recorded. Population data for the above species are unavailable.

E. Hawks, Eagles, Owls, and Crows.

Marsh hawks, red-tailed hawks, sparrow hawks, Cooper's hawks and turkey vultures were seen frequently throughout the year. American rough-legged hawks are winter residents.

An osprey was observed in early May along the Ferguson Bayou. The first Bald eagle was noted on March 30. During July four Bald eagles, two adult and two immature, were commonly observed perched in a dead Elm at the east end of Pool 1b and on the nesting islands probably feeding on dead fish. The last observation of a Bald eagle was made in October.

Great horned owls, short-eared owls, and screech owls were seen during the year. A female snowy owl was observed on November 1 and was still present at the end of the year. The bird allowed a pickup truck to get within 15 feet before flushing.

Crows were observed commonly from February 11 through late December. An estimate of 300 birds used the area during the period. The winter resident population is approximately 50.

F. Other Birds.

No unusual observations this period.

G. Fish.

An overabundance of carp in ditches and pools provide some problems to refuge operations. Carp limited the success of banding operations through disturbance of the trap sites in their efforts to eat the bait. Carp also "ate out" holes around the traps where corn had been placed. When the fish concentrated in a baited area actual slumping of earth near the site was observed. On one float trap carp were observed out of water and on the trap in their efforts to feed. Northern pike were observed during the Pool 1 draw down. Crappies were also present.

H. Reptiles.

Fox and garter snakes were the most common snakes on the refuge. Map turtles and painted turtles were frequently observed. Snapping turtles were present.

I. Amphibians.

Leopard and pickerel frogs were common. The bullfrog population was about normal.

J. Disease.

No major die offs due to disease were recorded during the year, however the following observations were made:

Waterfowl. During the spring migration two Whistling swans were examined and lead poisoning was indicated (see Section V, Shiawassee Study Project No. 2). On January 11 a Canada goose was found dead on the north side of the Riverside dike near the Hayden. A necropsy showed no internal or external damage. Gizzard worms were noted and large amounts of body fat observed. Cause of death was unknown. Another Canada goose was found on October 3. The bird was in a weakened condition and died after several days. No post mortem examination was made. On December 9 a dead female mallard was observed in Pool 1b. The bird could not be retrieved since it was lying on thin ice.

Mammals. Several muskrats trapped during the 1965-1966 season contained small white "maggot" like organisms in the chest cavity. These animals were taken in the southwest corner of Pool 1b which had not been trapped the previous season. An over population may have resulted in this condition. The pelts did not appear to be adversely affected. In late December three more muskrats with a similar condition were taken. One of these animals will be taken to the University of Michigan for necropsy.

III. REFUGE DEVELOPMENT AND MAINTENANCE

A. Physical Development.

1. Dikes and Ditches.

The spoil material from ditch clean-out in Farm Unit 121a was levelled down and seeded to grass for future erosion control.

Ditch clean-out and installation of tube with slide gate was completed in Farm Unit 115 to improve tile drainage and facilitate pumping operations.

A non-functional tube was removed from the Riverside dike along the north side of Farm Unit 121a to speed up flows and improve pumping operations.

The old control tube in the east dike of Pool 2 was removed. This stopped a leak situation that had caused a continual dike washout problem.

The old bridges across the County Drain at entrance to Secondary Headquarters and to Farm Unit 153 were replaced by culverts. Flood damage repairs were completed to the Pool 1 dike system. This included a complete raising and rebuilding of this low-level dike, and spot repairs to the Pool 1a outside dike. All trees were removed from the Center Dike north of the Goose Pen and dike repairs and sloping completed. All repaired sections of dikes were levelled and sloped, seeded to grass, and dike tops gravelled.

2. Roads and Trails.

All interior refuge roads were gravelled and then graded periodically during the year as required. New gates were constructed and installed at access points. All grass strips along road-ways were mowed during summer months.

Road-ways on dike tops were gravelled to provide all weather travel routes for waterfowl census activity.

3. Fencing and Posting.

The entire refuge boundary was checked and reposted where needed prior to the hunting season. This year, for the first time, buoys to mark refuge boundary were set out in the Shiawassee and Cass Rivers. Prior to the deer hunting season, public hunting areas were posted and signs were removed immediately following the close of the season. One mile of new boundary fence was installed along the south and east sides of Tracts 172 and 173. The entire fenced boundary was checked and fence repairs completed where needed.

4. Pool 1 Habitat Improvement.

Drawdown of Pool 1 was initiated on May 5, as soon as it became apparent that the peak of goose hatch had occurred. Both Pools 1a and 1b were dry by June 2 except for borrow pits and the lowest areas. Water was removed entirely by gravity through the pump structure and control.

As soon as the bottom of Pool 1b was dry enough to permit use of equipment, island rebuilding was started. All islands in the pool were rebuilt to repair flood damage and then seeded to grass. Forty-eight nesting islands, averaging six feet high with 15 foot top diameter and 3 to 1 side slope were re-constructed using the TD-14 and TD-18 bulldozers. Total costs were $351.61 which included tractor operational costs, labor, equipment moving costs, seed, and mulching costs, or $7.33 per nesting island.

Pool 1b was drained only so flood damage repairs to islands and to the low level dike could be completed, so the pool was reflooded immediately upon completion of this job. Pumping was started on July 5 and the pool was back to the approved summer elevation on July 28.

Pool 1a dried up sufficient to permit equipment operation by the middle of July. Primary objectives in habitat improvement work in this pool were limited to cattail control, removal of willows, and repairs to nesting islands and the inside slope of the Center dike.

Selected areas of the pool were disced to knock cattails down, and to scarify the soils to stimulate smartweed growth. The smartweed showed excellent response and an excellent seed crop was produced.

All islands were reconstructed, using the two bulldozers. The large expanse of higher area of the pool that was overgrown with willows was the next objective. All willows were dozed into piles and covered with earth to create new nesting islands while

opening up the pool area. This method of willow control was used in Pool 1b in 1964 with excellent results. All islands, and the dike slope were then seeded to grass, and reflooding was started on August 22.

Levels were raised by pumping progressively throughout the fall months until approved overwinter elevation was reached on October 29.

Production of waterfowl foods in Pool 1 far exceeded anything we had planned for. Smartweed volunteered all over the pool and seed production was unbelievable. Wild millet also came in densely along pool margins and at higher elevations to provide another bumper crop of seed to add to the vast abundance of food available to waterfowl this fall.

Prior to reflooding, a new cannon net trapping site was prepared in Pool 1a. This was readily accepted by the birds and several catches of ducks and geese were made at this site during the fall banding operation.

5. Miscellaneous Jobs.

Regular and routine repair and maintenance of all vehicles, heavy equipment, pumps and buildings.

Construction activities included a shelter for the Pool 1 pump; an outhouse for Secondary Headquarters and new doors for the garage located at Secondary Headquarters.

Beautification activities were confined to the headquarters area and consisted of placing additional crushed rock mix in the headquarters courtyard and residence driveway. Road ditches on the south and west side of the headquarters were filled in, levelled off and seeded to grass.

The Pool 1b net trap site was re-graded and gravelled and a new net trapping site was constructed for Pool 1a.

The old goose pen fence was removed.

B. Plantings.

1. Aquatic and Marsh Plants.

None.

2. Trees and Shrubs.

None.

3. Upland Herbaceous Plants.

About 25 acres in Tracts 121, 123, 124, 127, 149, and 205 were seeded to bromegrass, ryegrass, fescue mixture, primarily for erosion control on dikes, nesting islands, retired croplands, and grass strips bordering farm fields.

4. Cultivated Crops.

Agricultural crops were planted on 2,846 acres of refuge lands, with all farming operations completed under cooperative farming agreements by local cooperators. Refuge crops and yield data are summarized on NR-8 and following tables. Seven crops were produced in 1966 and included wheat, barley, oats, field corn, white beans, soybeans, and sugar beets. Yields were generally lower than normal, but about equal to 1965, as a result of drought conditions through much of the growing season. The average income per acre for refuge lands was $74.16 as compared to $70.20 per acre in 1965 and $91.38 per acre in 1964.

A total of 36 acres of wheat, 47 acres of barley and 128 acres of corn was left in the field for wildlife use. The wheat and barley was chopped using a rotary mower in August and early September and was completely consumed by waterfowl. The 128 acres of corn has been left standing in strips and will be knocked down during the coming winter so as to be available to migrant waterfowl in the spring. Forty-one acres of refuge share corn was harvested by cooperators, dried and put in storage for refuge use, and for transfer to Seney and Ottawa Refuges.

Cover crops planted in 1966 included ryegrass in corn, clover and alfalfa with wheat and barley and rye-winter wheat on bean ground on a total of 834 acres. These practices provide erosion control and grazing acres for geese in addition to the primary green manure function.

As a test, in 1966 it was decided to permit fall plowing of 536 acres refuge lands if the cooperator would seed the plowing to an oats cover crop. In theory this would work both ways as the farmer could fall plow the land and we would have a benefit of a cover crop. As a result of drought conditions, the oats did not germinate until late in November so we were left holding the bag. However, this offers some promise to improve our land management if some additional controls and conditions are required, and it is planned to continue the trial at least one more year.

Land capability plans have been almost completed for the entire refuge acreage by the local Soil Conservation District and it is planned to complete the new land use plan in 1967.

SHIAWASSEE REFUGE

REFUGE CROPS - 1966

CROP	ACRES	% OF TOTAL ACREAGE
Wheat	122	4.28
Barley	376	13.21
Oats	84	2.95
Field Corn	705	24.76
White Beans	786	27.61
Soybeans	524	18.41
Sugar Beets	250	8.78
TOTALS:	2,847	100.00

CROP YIELDS - 1966

WHITE BEANS

Cooperator	Acres	CWT/Acre	$/CWT	$/Acre
I. Almy	78	11.3	5.46	61.84
Bowden Bros.	84	10.4	6.13	63.65
D. Boese	114	7.4	5.75	42.43
M. Boese	114	12.6	5.51	69.42
G. Bremer	66	12.0	5.69	68.41
R. Bremer	56	8.6	5.19	44.79
J. Bruns Jr.	20	10.5	5.80	61.16
J. Bruns Sr.	12	7.5	5.33	39.78
J. Gempel	13	11.9	6.19	73.37
C. Gosen	103	12.4	5.57	70.24
H. Gosen	24	13.8	5.25	69.31
M. Hart	28	8.6	5.77	49.55
A. Peaphon	30	9.2	5.34	49.13
A. Schluckebier	20	15.5	5.50	85.29
W. Wasmiller	24	14.4	5.77	83.20
TOTALS:	786	Ave. 11.1	5.62	62.10

OATS

Cooperator	Acres	Bushel/Acre	$/Bushel	$/Acre
I. Almy	53	80.9	.65	52.60
J. Bruns Sr.	11	31.9	.64	20.42
H. Fawcett	20	44.2	.64	28.29
TOTALS:	84	Ave. 52.3	.64	33.77

CROP YIELDS - 1966

SOYBEANS

Cooperator	Acres	Bushel/Acre	$/Bushel	$/Acre
I. Almy	27	15.1	2.64	39.76
D. Boese	145	14.5	2.68	38.86
Bowden Bros.	80	24.7	2.87	71.03
J. Bruns Jr.	22	9.4	2.68	25.31
H. Fawcett	50	27.5	2.68	73.80
J. Gempel	14	33.4	2.68	89.43
C. Gosen	37	37.3	2.72	101.54
D. Gross	15	23.0	2.66	61.18
M. Hart	46	31.3	2.68	83.85
W. Oldenburg	12	17.9	2.68	47.97
A. Peaphon	40	37.8	2.72	102.91
W. Wasmiller	36	21.0	2.66	55.82
TOTALS:	524	Ave. 24.4	2.70	65.96

BARLEY

Cooperator	Acres	Bushel/Acre	$/Bushel	$/Acre
I. Almy	25	78.9	1.08	85.21
M. Boese	106	77.1	1.08	83.27
D. Boese	22	65*	1.08*	70.20*
Bowden Bros.	40	76.9	1.11	85.36
G. Bremer	28	72.5	1.08	78.30
R. Bremer	33	34.0	1.08	36.72
J. Bruns Sr.	11	44.6	1.13	50.40
H. Gosen	10	59.4	1.08	64.15
C. Gosen	76	70.2	1.13	79.33
A. Peaphon	14	65*	1.08*	70.20*
TOTALS:	375	Ave. 64.2	1.10	70.34

* *Estimated yields and values - left in field for wildlife

CROP YIELDS - 1966

CORN

Cooperator	Acres	Bushel/Acre	$/Bushel	$/Acre
I. Almy	61	42.9	1.19	51.05
D. Boese	70	80.9	1.22	98.70
M. Boese	145	81.0	1.20	97.20
Bowden Bros.	17	52.2	.97	42.68
G. Bremer	23	43.3	1.20	51.95
R. Bremer	53	87.6	1.20	105.12
J. Bruns Sr.	22	18.1	1.05	19.00
H. Fawcett	13 *			
J. Gempel	20	67.5	1.12	75.60
C. Gosen	62	82.8	1.20	99.36
M. Hart	41	50.6	1.20	60.72
E. Jakones	50	75.0	1.20	90.00
A. Peaphon	92	82.0	1.20	98.40
A. Schluckebier	36	93.2	1.29	120.23
TOTALS:	705 Ave.	65.9	1.17	77.69

* Not harvested

WHEAT

Cooperator	Acres	Bushel/Acre	$/Bushel	$/Acre
D. Boese	26	50*	1.70*	85.00*
R. Bremer	20	69	1.74	120.06
H. Gosen	14	48	1.70	81.60
A. Peaphon	52	69	1.74	120.06
A. Schluckebier	10	50*	1.70*	85.00*
TOTALS:	122 Ave.	64.2	1.72	98.34

* Estimated yields and values - left in field for wildlife

CROP YIELDS - 1966

SUGAR BEETS

Cooperator	Acres		Tons/Acre	1st Payment $/Ton	$/Acre
I. Almy	97		21.4	5.34	114.27
R. Bremer	35		14.3	5.04	72.07
H. Gosen	23		19.1	7.37	140.77
A. Peaphon	57		16.4	5.60	90.20
A. Schluckebier	38		22.8	6.15	140.22
TOTALS:	250	Ave.	18.8	5.90	110.91

MAMMOTH CLOVER

I. Almy	13	21.04 Tons

Three meetings were held with all farming cooperators during the year to discuss farming operations, crop yields, etc.

C. Collections and Receipts.

1. Animal Specimens.

None.

2. Refuge Herbarium.

Several new plant specimens were collected and worn specimens replaced in the refuge herbarium by Wildlife Aid Bellinger.

D. Control of Vegetation.

Weed control on agricultural lands was completed by the cooperators at their expense as a condition of the cooperative farming agreement.

Approximately 10 pounds of 2,4,5-T and 32 pounds of 2,4-D were sprayed at various locations on the refuge for control of undesireable weeds and brush, primarily on fence lines, dikes, and ditch banks. 2,4,5-T is very effective on willow species and produced a kill of about 85% of plants with no regrowth when control is effected in May and early June. Late treatment is less effective. 2,4-D was used to control Canada thistle, milkweed, mustard, ragweed and other broad-leafed plants and resulted in an estimated 90% kill with little regrowth.

E. Planned Burning. None.

F. Fires. None

IV. RESOURCE MANAGEMENT

A. Grazing. None.

B. Haying.

Thirteen acres of mammoth clover, originally seeded as cover crop in Farm Unit 143 in 1964 was hayed. The unit produced 21.04 tons of hay with receipt to refuge of $105.20.

C. Fur Harvest.

A ground count of muskrat houses was made on November 12, 1965 in order to ascertain the present population on the refuge so that annual fur removal recommendations could be made. The population was estimated at between 2000 and 2500 individuals. It was believed that 75% of the population should be harvested and thus the approved quota was set at 1875 animals, allowing for revision if necessary.

In Michigan, the season for muskrat and mink extended from November 25 through January 31. For raccoon the season was from November 25 through December 31.

For muskrat the share was on a 60-40% basis, with 60% to go to the trapper. Mink were to be shared on a 50-50% basis. Of all other species trapped, 100% would go to the trapper.

The 1965-66 harvest was accomplished under one permit for the entire area. A total of 713 muskrats and 1 oppossum were taken. All of the muskrat furs were sold to a local buyer at the highest bid. The 713 pelts brought a record high price of $1,650.00. This represented an average of $2.31 per pelt. The refuge share (40%) was $660.00. The selling of furs locally definitely increased receipts and reduced the cost of handling.

Relatively mild weather during December 1965 hampered trappers and reduced size of the harvest noticeably.

Of 250 muskrats aged, the age ratio was 5:1, immatures to adults.

The ground count of muskrat houses was conducted again in 1966 on November 14 to determine population trends. A total of 250 houses was counted in pools and in the river marshes with population of muskrats estimated at 2,500.

Two trapping permits have been issued for the 1966-67 trapping season which will end on January 31, 1967. Again this year, mild weather during December hampered trappers as ice in the units was not strong enough to permit full trapping activity. Only 205 muskrats have been taken by permittee trappers through the end of December.

D. Timber Removal. None.

E. Commercial Fishing. None.

The following is a tabulation of refuge cash receipts for calendar year 1966 from various economic uses permitted.

Source of Receipts	Total Received
Sale of surplus farm crops:	
White beans	$11,598.34
Soybeans	8,246.28
Sugar beets	15,001.41
Fur Harvest Receipts	660.00
Miscellaneous Receipts	155.20
Total Receipts:	$35,661.23

V. FIELD INVESTIGATION OR APPLIED RESEARCH

A. Shiawassee Study Project No. 1.

This project, one of two approved wildlife management studies initiated at this station was conducted in the third year of its proposed five year span. Principal objectives of this study include life history, nesting phenology and success of the refuge Canada goose flock. Also included in the objectives are correlation of population trends with changes in nesting habitat, determination of mortality, and migration behavior.

With three years of the proposed five year study completed, results are not conclusive. A summary of data collected and observational generalizations will be made.

A word concerning the background of the study project should be mentioned. The original Canada goose flock consisted of approximately 435 semi-domestic birds. These birds were obtained from the Michigan Department of Conservation, about 100 geese per year, and released at three years of age. An estimated 60 pairs were nesting on the project in 1962 and 50 pairs in 1963, producing 225 and 175 goslings respectively. The study of the natural development and behavior of this flock may determine the justification for the establishment of flocks of semi-domestic Canada geese in other areas.

1. Methods and Procedures.

Determination of spring arrival dates and general observations of territorial behavior were completed in March and the first three weeks of April, 1966. During the last week of April, a nesting survey was conducted. Data recorded included, number of nests, clutch sizes, relation of nests to vegetational and topographic features, development of nests, and nesting behavior. A re-survey was completed the first week of June, following observation of the first successfully hatched brood. Data were recorded as to success of hatching and possible mortality factors.

An attempt was made to trap and band goslings to determine future age classes, migration routes, and effects of hunting mortality. All goslings trapped by the use of small drive traps were sexed and banded with a standard Fish and Wildlife Service band. In addition, a white base vinyl plastic leg band with a green stripe, designating a 1966 raised gosling, was attached to the right leg if female and to the left leg if male.

Other general observations of chronic mortality and possible causes, relationships with other waterfowl, and feeding habits were made during the study period.

2. Results and General Conclusions.

The first group of 49 Canada geese arrived at Shiawassee Refuge on March 2, 1966. By March 14, 1966 the population had increased to approximately 14,000 birds and peaked at 20,000 by the end of March. As in past years, the resident flock immediately separated itself from the migrating birds both in feeding and loafing areas. On March 5, several pairs were observed loafing on islands in Pools 1 and 2. Of 10 Canada geese observed in the goose pen on March 10, eight were identified by red and white leg bands as having been raised in 1965.

The first observed nesting activity was in the third week of March in a nesting tub in the goose pen. The start of nesting appeared to be spread out over a three to four week period by the various pairs.

A total of 39 nests were located during the surveys in comparison to 28 in 1965. Maps 1, 2, and 3 show the location of the nests. A total of 224 eggs were found with an average clutch size of 5.7. Preferred sites were about the same as in past years with artificial nesting islands providing 30 or 77% of nest sites while nesting tubs accounted for 3 or 8% and muskrat houses supported 5 or 12%. One nest was located on a dike.

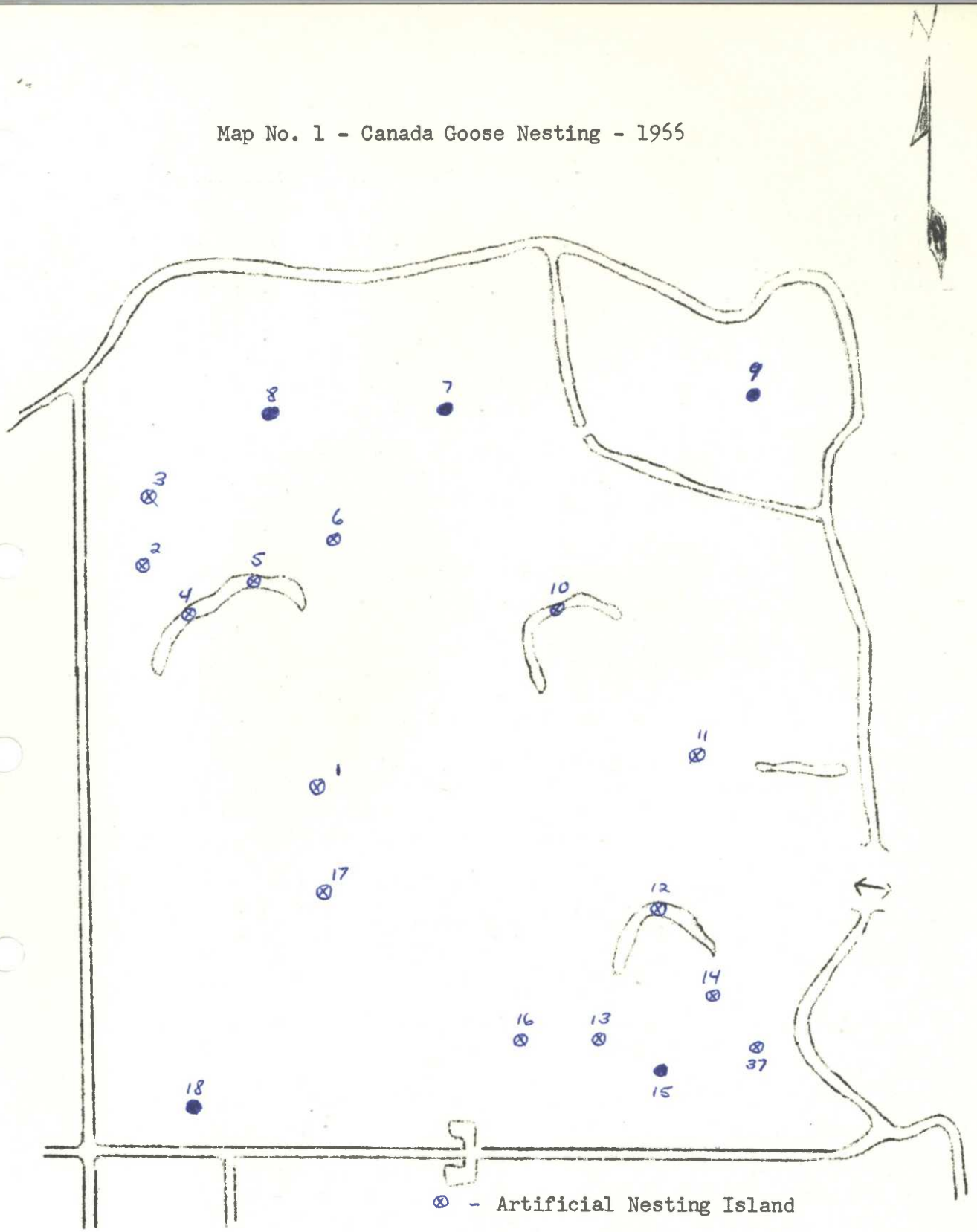
High pool elevations, strong winds, and previous damage to islands in the flood of 1965 reduced the number of available sites. The increased use of muskrat houses and nesting tubs may have been the result of these above factors.

A variety of nesting cover was utilized including cattail (Typha spp.), smartweed (Polygonum spp.), reed canary grass (Phalaris spp.), willow (Salix spp.), and several other marsh and aquatic plants. In all cases dead vegetation of the dominant cover type provided the needed nesting material.

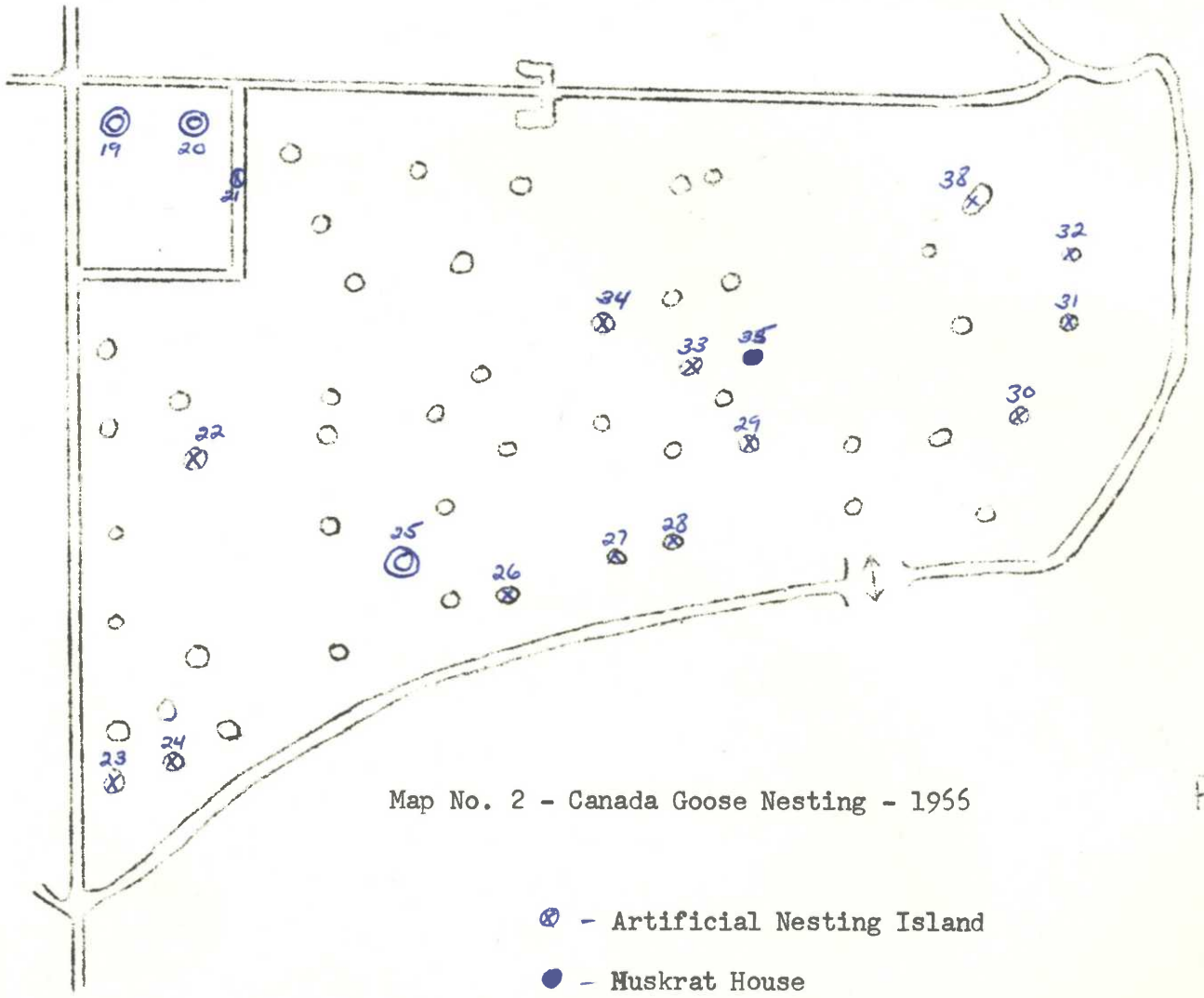
Nest sites were randomly located throughout the pools. Most nesting islands which had remained in relatively good condition were utilized. The degree of defense of the nest was about the same as in past years with increased defense activity as incubation progressed.

The first successfully hatched brood was sighted on May 2, 1966. The re-survey of nests was conducted during the first week of June. At this time, both Pool 1a and 1b had been drawn down to start habitat improvement work. It was difficult to obtain accurate figures on the hatching success since it appeared that predators had moved into the area and destroyed any eggs remaining. Only five unhatched eggs were found and they were located in two nesting tubs. The remainder of nests appeared to have hatched either partially or totally.

Map No. 1 - Canada Goose Nesting - 1966



Pool 1A



Map No. 2 - Canada Goose Nesting - 1955

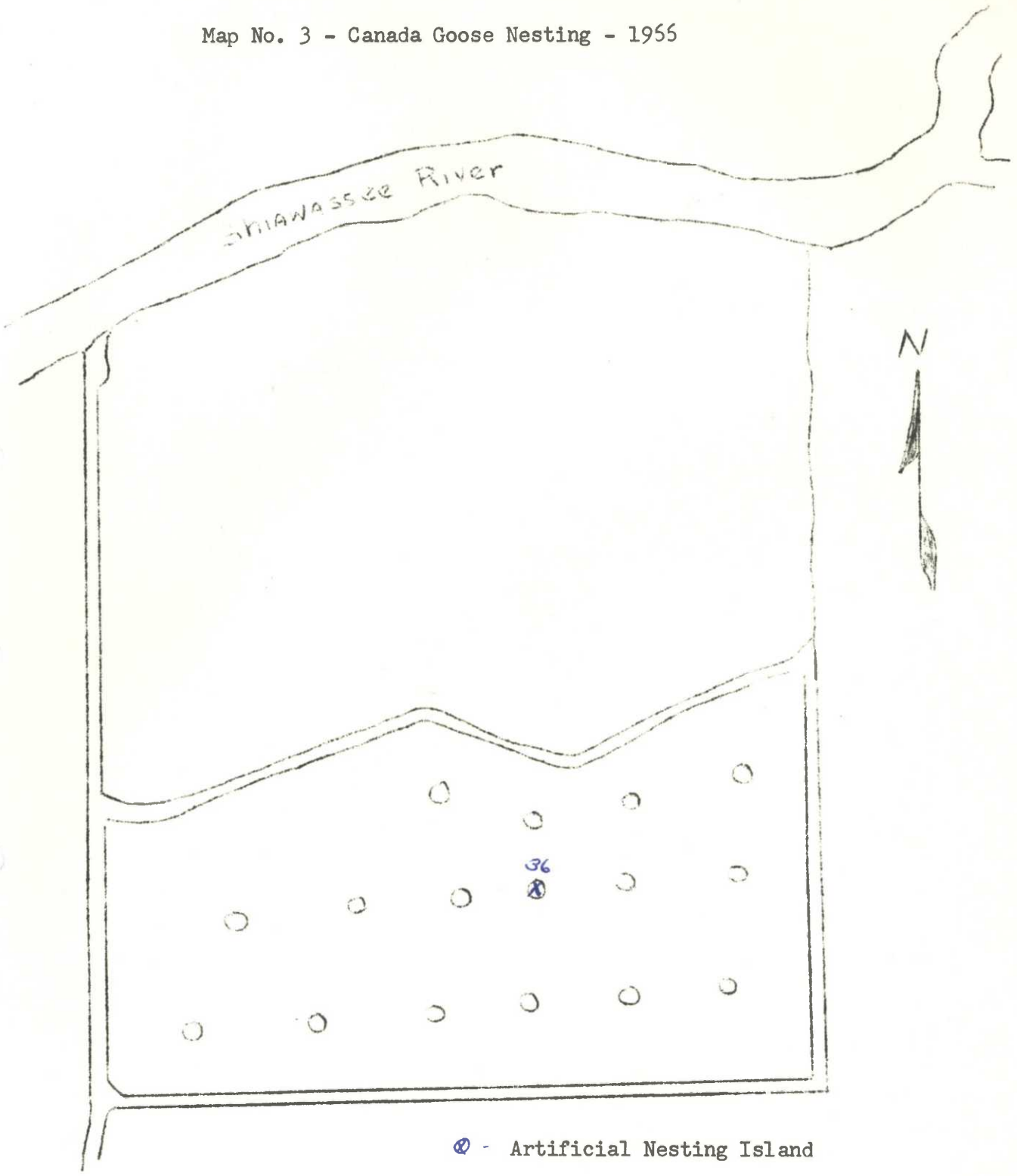
Pool 1b

⊗ - Artificial Nesting Island

● - Muskrat House

◎ - Artificial Nesting Tub

Map No. 3 - Canada Goose Nesting - 1966



⊗ - Artificial Nesting Island

Pool 2

An indication of hatching success was obtained from a brood count. On June 16, an actual count of 193 goslings was made. This would indicate that at least 86% of the eggs hatched successfully.

On June 16, two small drive traps constructed in Farm Units 121a and 121b were used by refuge personnel to trap 159 goslings including 75 females and 79 males. Five goslings died in the traps due to the large number of birds and the high temperature on that day. Prior to trapping, the goslings fed primarily on fields in Farm Units 121 and 122. Feeding occurred on young stems of barley, white beans, soybeans, and field corn.

There were no known losses due to disease during the year.

3. Summary and General Conclusions of Study Project No. 1.

The following is a summary of information gathered over three of the five years of this study project.

During the spring migration Canada geese have appeared on the refuge during the first week in March. Peak numbers have been on the increase over the past years with the peak occurring during the last week in March. It has been noted that resident birds have separated themselves from the migrant flock in both feeding and loafing areas soon after arrival.

Territorial defense by nesting pairs has been noted soon after arrival. Nesting activity has first been observed in late March and the first week in April. During this period nesting surveys have been initiated.

Nesting site preferences, preferred nest construction materials, average clutch size, and degree of defense of nest were some of the information sought in these first nesting surveys. Artificial nesting islands provided the majority of nesting sites. The following table summarizes this data.

Nest Sites of Canada Geese

	Nesting Islands	Muskrat Houses	Ditches, Dikes	Nesting Tubs
Number of Nests	80	8	10	4
Percentage	78%	8%	10%	4%

The selection of nesting sites indicate a preference on the part of Canada geese for an elevated site, close to water and permitting a generally good view of the surrounding area. A variety of nesting cover has been utilized with little preference recognized. Some species utilized include: smartweed (Polygonum spp.), reed canary grass (Phalaris spp), cattail (Typha spp.), brome grass (Bromus spp.), thistle (Cirsium spp.), and willow (Salix spp.). In all cases, dead vegetation of the dominant cover type provided the materials for nest construction.

Information concerning average clutch sizes is shown in the following table.

Average Clutch Size of Canada Geese

	No. of Nests	No. of Eggs	Eggs/Nest
1964	35	188	5.4
1965	28	139	5.0
1966	39	224	5.7
Total	102	551	5.4

Degree of defense of the nest was observed during nesting surveys. It has been noted that the degree of defense of the nest varies directly with the progression of incubation.

The first successfully hatched broods have been observed from early to mid-May. Re-surveys of the nests have been conducted to determine the success of the year's nesting effort. The following table summarizes production to date.

Hatching Success of Canada Geese

	No. of Eggs	No. of Eggs Hatched	Percentage Hatched
1964	188	150	79.8%
1965	139	115	82.7%
1966	224	193 *	86.2% *
Total	551	431	78.2%

* Based on total gosling count on June 16.

Sterility or death of an advanced embryo have been the primary causes for unhatched eggs. A few instances of predation were noted, but these were of little overall importance.

Broods have generally fed in the agricultural crops in Farm Units 121 and 122. Young stems of barley, white beans, and invertebrate life have served as the preferred foods. Trapping and banding of goslings has been conducted at this time. The results of these efforts are shown in the following table.

Banding of Goslings - Shiawassee Study Project No. 1

	Male	Female
1964	41	35
1965	40	30
1966	75	79
Total	156	144

Few returns of banded birds have resulted to date. This facet of the project will be discussed at the termination of the study with the hope that additional information may give more reliable conclusions. Several observations of color bands reported indicate the nesting flock apparently winter in southern Illinois.

No known losses to disease have been observed during the study to date. A study to determine the presence of Plasmodium infection in the Seney flock and related flocks, namely Shiawassee, was initiated in 1965 by the Patuxent Wildlife Research Center. To date no results have been received.

The study project will be continued for two more years and a full report will be prepared at the termination of the study.

B. Shiawassee Study Project No. 2.

The study of the ecology of the Whistling Swan on the Shiawassee Refuge is now in its fourth year. The main objectives of this study are to: determine habitat preferences, migratory patterns, morphological characteristics of species, sex, and age classes, and origin and extent of all mortality; provide improved methods for trapping and marking swans; and correlate current and future land management practices with annual population numbers.

1. Population Data.

The first migrant Whistling swan (Olor columbianus) arrived on the refuge on March 13, 1966. By March 14, 600 were present and the population reached a peak of 2100 on April 4. Within the next few days the majority of the swans had left the refuge. On April 9 about 150 birds moved into the refuge, including a large proportion of immature birds. These birds were observed leaving the refuge the same day and not returning.

Populations were again low in comparison to averages over the last five years. Throughout the period of observation, very few distinguishable family groups were observed. Of the first group that arrived, all were adults.

Although whistling swans commonly pass through the Saginaw Valley area during the fall migration, they have not in past years stopped on the Shiawassee Refuge at this time. On November 2, thirty two whistling swans (15 adult and 17 immature) were sighted on the refuge by refuge personnel. On November 5, thirty five swans were observed. This was an indication of what was to come for on November 8 and 9, 300 and 350 swans respectively were observed using the refuge area. Breaking the flock into family groups showed about one half to be immature birds. The majority of the swans had gone by November 13, but a few remained as late as December 10. Two presumably injured birds are still present.

2. Determination of Movements.

In an attempt to capture whistling swans, two cage traps were constructed in Farm Unit 121b of the same design used in previous years. Two standard cannon net traps were set up and baited with corn in Pool 1 and Farm Unit 121a. Fourteen whistling swans were trapped and banded in the spring of 1966, four being trapped in the cage trap and 10 in the cannon net traps.

During the fall migration, 37 whistling swans were trapped and banded. On November 7, Refuge Manager Frye, using the cannon net trap, captured and banded three swans. On November 9, 34 swans were captured by means of the cannon net trap.

Following the above captures, each swan was banded on the left leg with a standard Fish and Wildlife Service metal band and a two inch yellow vinylite plastic band was attached to the right leg. A few drops of acetone was used to seal the plastic band. An additional yellow vinylite plastic neck band was placed on each bird.

Dyeing of the breast and neck was completed by placing the swan in a burlap bag with only the parts to be dyed exposed. A solution of snythetic Dupont Rhodamine B Extra red dye was applied with a paint brush. Each bird remained in the bag for approximately one hour and allowed to dry. Birds were subsequently released into Pool 1.

After banding and dyeing of the swans was completed, the Regional Office was informed. They contacted Bureau, State, Canadian biologists, and other field observers and requested observation notes. The following table summarizes the observation reports of marked birds received to date.

It is believed that marking of the birds in the fall should produce the best chances for observation since the birds will retain the color on both the wintering and breeding grounds before they molt. Spring dyeing of birds will yield observations only on the way to and on the breeding grounds. Fall capture of swans will be encouraged and if birds continue to use the refuge in the fall the outlook appears promising.

Sight Location of Whistling Swans Marked at Shiawassee Refuge

Observation No.	Dates Observed	Location
1	April 20, 1966	Bordman River, Traverse City, Michigan
2	April 24, 1966	Sherburne NWR, Minnesota
3	April 25, 1966	Wexford County, Michigan
4	December 13 & 14, 1966	Ottawa NWR, Oak Harbor Michigan

3. Behavior

Upon arrival to the refuge in the spring, a preference of feeding was established in flooded sugar beet fields and field corn fields on private land adjacent to the south boundary. Dewatering of this private land took place shortly after and feeding occurred in flooded fields, primarily corn, in Farm Units 121a, 121b, and 122. Some movements to and from the Shiawassee River State Game Area were noted. Loafing and resting occurred in flooded fields that had been fall plowed. Corn comprised the staple of the diet with rye grass making up the balance. The swans did not use areas in which Canada geese and ducks were present. There appeared to be very little tolerance between the different species groups. Courtship display was commonly observed during feeding periods.

Fall use of the refuge by swans consisted for the most part of loafing and resting in the north portion of Pool 1a, occasionally in Pool 1b. Individuals or pairs were observed feeding in grain stubble and corn fields where geese and ducks were feeding but their activity was generally on the periphery of the goose and duck groups. Some feeding in soybean and sugar beets was noted. Feeding of swans in the agricultural crop fields during their 1½ week stay in the fall was limited. The majority of all swan activity in the fall was centered in Pool 1.

4. Additional Information.

a. Morphological Characteristics and Observations.

Measurements were made concerning morphological characteristics of captured swans as outlined in the Shiawassee Study Project No. 2. These data are summarized in the following tabulation. It should be noted that the measurement of the median width of the 1st primary was changed to maximum width of the 1st primary to assure future consistency in the data. Wing length must be measured from the wrist to the tip of the wing.

b. Disease and Mortality Investigations.

Six swans were found dead on the refuge during the spring migration. Two of these birds were trapped and died during handling. The condition of the other birds indicated lead poisoning and such may have been the cause of the emaciated condition noted in these birds. Overall, fewer sick birds was observed this spring than in previous years.

During the fall migration few sick birds were observed. One bird died as a result of being trampled by the other captured birds. Several of the captured birds were observed in a weakened condition following their release. Whether this was a result of handling or the birds were sick upon arrival is not known. Some of these birds were subsequently found dead. In some instances disposal of the carcasses by carnivores was apparent. Whether the birds had died or had been killed by carnivores is not known. In total, four birds of those trapped in the fall were lost.

On November 16, an adult female swan, presumed injured by gunshot, was brought to refuge headquarters. The wing was injured and the bird could not fly. It was banded and released into Pool 1 and has not left to date.

5. Summary and General Conclusions of Study Project No. 2.

With four years of the proposed five year study of whistling swans completed, certain generalizations concerning the objectives of the study may be made at this time.

1966 - WHISTLING SWAN - MORPHOLOGICAL CHARACTERISTICS AND OBSERVATIONS

Bird No.	66-1	66-2	66-3	66-4	66-5	66-6	66-7	66-8	66-9
Band Number	509-20524	509-20525	509-20526	-	509-20527	509-20528	509-20529	509-20530	509-20531
Date	3/28/66	4/1/66	4/4/66	Emaceated	4/4/66	4/4/66	4/4/66	4/4/66	4/16/66
Total Weight (lbs. - oz.)	11-11	10-12	8-12	7-3	14-12	9-8	11-3	14-9	12-0
Age *	Immature	Immature	Sub-Adult	Immature	Adult	Adult	Immature	Adult	Adult
Sex	Female	Female	Female	Female	Male	Female	Female	Male	Female
Bursa of Fabricus	Present	Present	Absent	Present	Absent	Absent	Present	Absent	Absent
1. Depth (mm)	10	13	-	10	-	-	13	-	-
Oviduct	Closed	Closed	Open	Closed	-	Open	Closed	-	Open
Penis									
1. Diameter (mm)	-	-	-	-	Measurement	-	-	Measurement	-
2. Length (mm)	-	-	-	-	Not	-	-	Not	-
3. Small & Corkscrew	-	-	-	-	Completed	-	-	Completed	-
4. Sheathed	-	-	-	-	-	-	-	-	-
5. Color (pink)	-	-	-	-	-	-	-	-	-
6. Appearance (Wrinkled)	-	-	-	-	-	-	-	-	-
Sphincter Muscle									
1. Diameter (mm)	31.2	19.9	18.0	18.1	12.1	16.8	12.3	14.9	12.0
2. Shape	Convex	Convex	Convex	Convex	Convex	Convex	Convex	Convex	Convex
3. Color (flesh pink)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wing & Primary Feathers									
1. Wing length (cm)	-	-	-	-	-	-	-	-	-
2. Length 1st primary ** (cm)	27.4	29.0	28.2	27.0	32.2	34.0	26.7	35.0	30.5
3. Max. width 1st primary (mm) *****	37.5	38.6	43.4	34.9	53.6	42.0	37.3	44.5	35.1
4. Wear 1st primary ***	Pointed	Pointed	Pointed	Pointed	Obtuse	Obtuse	Pointed	Obtuse	Obtuse
Spur Wing									
1. Feathered or bare	Feathered	Feathered	Feathered	Feathered	Feathered	Feathered	Feathered	Feathered	Feathered
Knobby or smooth	Knobby	Smooth	Knobby	Knobby	Knobby	Knobby	Knobby	Knobby	Knobby
Breast & Belly Feathers									
1. Average width (mm)	25.4	27.9	23.6	19.8	42.2	32.4	29.4	27.5	27.0

Bird No.	66-1	66-2	66-3	66-4	66-5	66-6	66-7	66-8	66-9
Tail Feathers									
1. No. Rectrices	-	-	-	-	-	-	-	-	-
2. Notched Rectrices	Notched	Notched	Notched	Notched	Unnotched	Unnotched	Notched	Unnotched	Unnotched
3. Length longest rectrice (cm)	14.2	14.8	14-2	16.0	21.0	28.5	17.0	20.0	19.5
4. Median width vane of longest rectrice (mm)	-	-	-	-	-	-	-	-	-
The Legs									
1. Dia. Tarsus mid-point (mm) ****	21.5	20.2	20.8	19.5	22.6	20.3	20.1	21.6	20.8
2. Total length Tarsus (mm)	-	-	-	-	-	-	-	-	-
The Bill									
1. Total length (mm)	84.1	87.4	90.0	88.8	93.2	84.6	83.9	92.3	95.8
2. Width of bill at nostrils (mm)	-	-	-	-	-	-	-	-	-
3. Width of nail (mm)	21.2	17.3	18.7	16.7	18.7	18.2	16.3	17.9	17.3
4. Distance of nostril from tip of bill (mm)	38.5	37.6	41.4	43.6	44.1	42.1	40.9	42.3	44.7
5. Yellow spot in lore	Absent	Absent	Absent	Absent	Present	Present	Absent	Present	Present
6. Area of yellow spot (mm^2)	-	-	-	-	165.6	248.0	-	51.7	215.25
7. Color or bill	Blotched	Blotched	Blotched	Flesh	Black	Black	Blotched	Black	Black
General Characteristics									
1. Body temperatures ^{o}F	107.0	104.6	106.0	102.0	102.2	104.2	104.6	105.4	102.8
2. Color of head & neck	Gray	Gray	Gray	Gray	White	White	Gray	White	White

* Immature = Up to 1 year of age
Sub-adult = 1-3 years of age
Adult = 3+ years of age

** Distal Primary

*** Wear determined from tips of primaries

**** Diameter taken at lateral dimension of Tarsus

***** This measurement made as median width in past years

1966 - WHISTLING SWAN - MORPHOLOGICAL CHARACTERISTICS AND OBSERVATIONS

Bird No.	66-10	66-11	66-12	66-13	66-14
Band Number	509-20532	-	509-20534	509-20533	509-20535
Date	4/16/66	Emaciated	4/18/66	4/18/66	4/18/66
Total Weight (lbs. - oz.)	13-3	8-7	12-12	9-8	8-9
Age *	Adult	Adult	Sub-Adult	Immature	Sub-Adult
Sex	Female	Female	Male	Female	Female
Bursa of Fabricus	Absent	Absent	Absent	Present	Present
1. Depth (mm)	-	-	-	16.0	9.0
Oviduct	Open	Open	-	Closed	Closed
Penis					
1. Diameter (mm)	-	-	6	-	-
2. Length (mm)	-	-	-	-	-
3. Small & Corkscrew	-	-	-	-	-
4. Sheathed	-	-	Yes	-	-
5. Color (pink)	-	-	Translucent	-	-
6. Appearance (wrinkled)	-	-	Smooth	-	-
Sphincter Muscle					
1. Diameter (mm)	12.0	12.5	15.0	8.2	13.2
2. Shape	Convex	Convex	Convex	Convex	Convex
3. Color (flesh pink)	Yes	Yes	Yes	Yes	Yes
Wing & Primary Feathers					
1. Wing length (cm)	-	53.6	54.0	51.0	50.5
2. Length 1st primary (cm) **	35.7	32.6	35.5	33.3	33.0
3. Max. width 1st primary (mm) *****	35.6	42.2	41.2	33.7	37.1
4. Wear 1st primary ***	Obtuse	Obtuse	Obtuse	Pointed	Pointed
Spur Wing					
1. Feathered or bare	Feathered	Feathered	Feathered	Feathered	Feathered
2. Knobby or smooth	Knobby	Knobby	Knobby	Knobby	Knobby
Breast & Belly Feathers					
1. Average width (mm)	30.0	26.5	25.2	23.1	23.5

Bird No.	66-10	66-11	66-12	66-13	66-14
Tail Feathers					
1. No. Rectrices	-	-	-	-	-
2. Notched Rectrices	Unnotched	Unnotched	Unnotched	Notched	Notched
3. Length longest rectrice (cm)	18.0	18.2	16.5	15.6	14.3
4. Median width vane of longest rectrice (mm)	-	-	-	-	-
The Legs					
1. Dia. Tarsus mid-point (mm) ***	21.5	20.1	22.0	18.0	17.5
2. Total length Tarsus (mm)	-	-	-	-	-
The Bill					
1. Total length (mm)	90.1	89.1	95.2	85.7	85.2
2. Width of bill at nostrils (mm)	-	31.4	33.5	30.1	31.8
3. Width of nail (mm)	19.4	16.8	18.1	17.0	16.5
4. Distance of nostril from tip of bill (mm)	41.5	40.7	42.0	39.2	39.1
5. Yellow spot in lore	Present	Present	Present	Absent	Present
6. Area of yellow spot (mm^2)	63.9	384.8	36.0	-	56.6
7. Color of bill	Black	Black	Black	Blotched	Blotched
General Characteristics					
1. Body temperatures °F	104.4	103.8	107.8	104.4	106.2
2. Color of head & neck	White	White	Gray	Gray	Gray

* Immature = Up to 1 year of age
Sub-adult = 1-3 years of age
Adult = 3+ years of age

** Distal Primary

*** Wear determined from tips of primaries

**** Diameter taken at lateral dimension of Tarsus

***** This measurement made as median width in past years

1966 - WHISTLING SWAN - MORPHOLOGICAL CHARACTERISTICS AND OBSERVATIONS

Bird No.	66-15	66-16	66-17	66-18	66-19	66-20
Band Number	509-20539	509-20540	509-20541	509-20542	509-20543	509-20544
Date	11/10/66	11/10/66	11/10/66	11/10/66	11/10/66	11/10/66
Total Weight (lbs. - oz.)	16-0	12-4	12-8	14-4	11-0	18-4
Age *	Adult	Immature	Immature	Immature	Immature	Adult
Sex	Female	Female	Female	Female	Female	Female
Bursa of Fabricus	Absent	Present	Present	Present	Present	Absent
1. Depth (mm)	-	-	11	13	11	-
Oviduct	Open	Closed	Closed	Closed	Closed	Open
Penis						
1. Diameter (mm)	-	-	-	-	-	-
2. Length (mm)	-	-	-	-	-	-
3. Small & Corkscrew	-	-	-	-	-	-
4. Sheathed	-	-	-	-	-	-
5. Color (pink)	-	-	-	-	-	-
6. Appearance (Wrinkled)	-	-	-	-	-	-
Sphincter Muscle	21.6	27.0	22.6	18.7	20.4	24.0
1. Diameter (mm)						
2. Shape	Convex	Convex	Convex	Flat	Flat	Flat
3. Color (flesh pink)	Yes	Yes	Yes	Yes	Yes	Yes
Wing & Primary Feathers						
1. Wing length (cm)	70.0	42.0	42.0	48.0	43.0	43.0
2. Length 1st primary ** (cm)	30.2	33.5	35.0	35.2	29.5	38.5
3. Max. width 1st primary (mm)*****	25.7	20.0	30.4	22.8	20.4	18.9
4. Wear 1st primary ***	Obtuse	Obtuse	Obtuse	Pointed	Obtuse	Obtuse
Spur Wing						
1. Feathered or bare	Feathered	Feathered	Feathered	Feathered	Feathered	Feathered
2. Knobby or smooth	Knobby	Knobby	Smooth	Smooth	Smooth	Smooth

Bird No.	66-15	66-16	66-17	66-18	66-19	66-20
Breast & Belly Feathers						
1. Average width (mm)	20.5	22.1	23.3	13.2	7.6	-
Tail Feathers						
1. No. Rectrices	-	-	-	-	-	-
2. Notched Rectrices	Unnotched	Unnotched	Notched	Notched	Notched	-
3. Length longest rectrice (cm)	17.3	17.0	14.4	13.1	18.3	-
4. Median width vane of longest rectrice (mm)	31.0	10.3	10.2	10.4	16.1	-
The Legs						
1. Dia. Tarsus mid-point (mm) ****	23.2	20.3	22.0	21.8	22.4	23.0
2. Total length Tarsus (mm)	11.7	11.3	9.8	11.5	12.8	10.0
The Bill						
1. Total length (mm)	96.3	86.8	86.3	95.0	91.8	92.3
2. Width of bill at nostrils (mm)	32.0	32.4	31.5	32.3	31.8	33.5
3. Width of nail (mm)	20.0	19.6	16.0	18.2	18.8	21.8
4. Distance of nostril from tip of bill (mm)	40.4	40.2	40.3	40.3	43.0	42.7
5. Yellow spot in lore	Present	Present	Absent	Absent	Absent	Present
6. Area of yellow spot (mm^2)	108.0	70.5	-	-	-	132.0
7. Color or bill	Black	Black	Flesh	Flesh	Flesh	Black
General Characteristics						
1. Body temperature	104.6	100.4	104.4	104.8	101.8	100.0
2. Color of head & neck	White	White	Gray	Gray	Gray	White

* Immature = Up to 1 year of age
Sub-adult = 1-3 years of age
Adult = 3+ years of age

** Distal Primary

*** Wear determined from tips of primaries

**** Diameter taken at lateral dimension of Tarsus

***** This measurement made as median width in past years

1966 - WHISTLING SWAN - MORPHOLOGICAL CHARACTERISTICS AND OBSERVATIONS

Bird No.	66-21	66-22	66-23	66-24	66-25	66-26
Band Number	509-20545	509-20546	509-20547	509-20548	509-20549	509-20550
Date	11/10/66	11/10/66	11/10/66	11/10/66	11/10/66	11/10/66
Total Weight (lbs. - oz.)	19-4	15-0	15-3	14-0	14-8	17-0
Age *	Adult	Immature	Immature	Immature	Immature	Adult
Sex	Male	Female	Female	Female	Female	Female
Bursa of Fabricus						
1. Depth (mm)	Absent -	Present 11	Present 10	Present 9	Present 11	Absent -
Oviduct	-	Closed	Closed	Closed	Closed	Open
Penis						
1. Diameter (mm)	11.3	-	-	-	-	-
2. Length (mm)	13.4	-	-	-	-	-
3. Small & Corkscrew	No	-	-	-	-	-
4. Sheathed	Yes	-	-	-	-	-
5. Color (pink)	Yes	-	-	-	-	-
6. Appearance (Wrinkled)	Smooth	-	-	-	-	-
Sphincter Muscle						
1. Diameter (mm)	22.3	18.6	22.7	14.5	-	17.5
2. Shape	Convex	Convex	Convex	Convex	Convex	Flat
3. Color (flesh pink)	Yes	Yes	Yes	Yes	Yes	Yes
Wing & Primary Feathers						
1. Wing length (cm)	70.0	47.0	43.0	48.0	46.3	53.0
2. Length 1st primary (cm) **	29.0	32.8	35.0	34.3	36.5	38.8
3. Max. width 1st primary (mm) *****	18.9	19.0	20.9	26.0	-	20.8
4. Wear 1st primary ***	Obtuse	Obtuse	Obtuse	Obtuse	Obtuse	Obtuse
Spur Wing						
1. Feathered or bare	Feathered	Feathered	Feathered	Feathered	Feathered	Bare
2. Knobby or smooth	Smooth	Smooth	Smooth	Knobby	Smooth	Knobby

Bird No.	66-21	66-22	66-23	66-24	66-25	66-26
Breast & Belly Feathers						
1. Average width (mm)	-	-	-	26.3	-	19.6
Tail Feathers						
1. No. Rectrices	-	-	-	-	-	-
2. Notched Rectrices	Unnotched	-	-	Notched	Notched	Unnotched
3. Length longest rectrice (cm)	-	-	-	12.9	13.4	18.0
4. Median width vane of longest rectrice (mm)	-	-	-	19.1	14.2	18.6
The Legs						
1. Diam. Tarsus mid-point (mm) ****	25.1	22.5	24.7	23.0	23.9	25.4
2. Total length Tarsus (mm)	15.4	11.8	11.2	11.2	11.0	9.8
The Bill						
Total length (mm)	97.0	91.9	94.0	92.0	96.0	91.0
2. Width of bill at nostrils (mm)	33.8	33.0	32.0	32.4	31.6	34.1
3. Width of nail (mm)	19.0	21.8	21.7	19.0	20.8	22.4
4. Distance of nostril from tip of bill (mm)	45.8	43.7	42.4	43.9	43.7	48.3
5. Yellow spot in lore	Present	Present	Absent	Absent	Absent	Present
6. Area of yellow spot (mm^2)	297.0	42.0	-	-	-	490.6
7. Color of bill	Black	Black	Flesh	Flesh	Flesh	Black
General Characteristics						
1. Body temperature	100.0	98.5	103.4	106.0	103.4	104.4
2. Color of head & neck	White	White	-	Gray	Gray	White

* Immature = Up to 1 year of age
Sub-adult = 1-3 years of age
Adult = 3+ years of age

** Distal Primary

*** Wear determined from tips of primaries

**** Diameter taken at lateral dimension of Tarsus

***** This measurement made as median width in past years

1966 - WHISTLING SWAN - MORPHOLOGICAL CHARACTERISTICS AND OBSERVATIONS

Bird No.	66-27	66-28	66-29	66-30	66-31	66-32
Band Number	509-20551	509-20552	509-20553	509-20554	509-20555	509-20556
Date	11/10/66	11/10/66	11/10/66	11/10/66	11/10/66	11/10/66
Total Weight (lbs. - oz.)	13-8	12-2	12-8	14-12	15-0	15-12
Age *	Immature	Adult	Immature	Immature	Adult	Adult
Sex	Female	Female	Female	Female	Male	Female
Bursa of Fabricus	Present	Absent	Present	Present	-	Absent
1. Depth (mm)	11	-	8	11	-	-
Oviduct	Open	Open	Closed	Closed	-	Open
Penis						
1. Diameter (mm)	-	-	-	-	6.2	-
2. Length (mm)	-	-	-	-	12.0	-
3. Small & Corkscrew	-	-	-	-	No	-
4. Sheathed	-	-	-	-	Yes	-
5. Color (pink)	-	-	-	-	No	-
6. Appearance (Wrinkled)	-	-	-	-	Smooth	-
Sphincter Muscle						
1. Diameter (mm)	19.9	-	18.4	15.4	14.8	18.8
2. Shape	Convex	Convex	Convex	Convex	Convex	Flat
3. Color (flesh pink)	Yes	Yes	Yes	Yes	Yes	No
Wing & Primary Feathers						
1. Wing length (cm)	45.0	49.0	54.8	47.0	48.0	49.0
2. Length 1st primary (cm) **	32.6	35.5	35.6	40.5	40.0	44.0
3. Max. width 1st primary (mm) *****	22.5	24.4	19.3	22.4	22.5	27.9
4. Wear 1st primary ***	Obtuse	Obtuse	Obtuse	Obtuse	Obtuse	Obtuse
Spur Wing						
1. Feathered or bare	Bare	Bare	Feathered	Feathered	Feathered	Bare
2. Knobby or smooth	Smooth	Smooth	Smooth	Smooth	Knobby	Knobby

Bird No.	66-27	66-28	66-29	66-30	66-31	66-32
Breast & Belly Feathers						
1. Average width (mm)	21.1	-	-	-	-	-
Tail Feathers						
1. No. Rectrices	-	-	-	-	-	-
2. Notched Rectrices	-	Unnotched	Notched	Notched	Unnotched	Unnotched
3. Length of longest rectrice (cm)	34.3	16.0	14.9	14.5	15.5	14.5
4. Median width vane of longest rectrice (mm)	14.7	20.0	17.7	16.7	17.3	14.8
The Legs						
1. Diam. Tarsus mid-point (mm) ****	21.8	19.0	22.0	23.9	24.6	24.5
2. Total length Tarsus (mm)	10.2	11.6	9.8	11.5	9.7	11.1
The Bill						
1. Total length (mm)	90.8	89.6	86.3	96.9	94.7	88.0
2. Width of bill at nostrils (mm)	32.0	31.4	31.7	39.5	32.6	32.4
3. Width of nail (mm)	18.5	22.7	20.7	23.2	21.4	20.6
4. Distance of nostril from tip of bill (mm)	42.3	42.6	37.2	46.0	49.8	44.4
5. Yellow spot in lore	Absent	Present	Absent	Absent	Present	Present
6. Area of yellow spot (mm^2)	-	64.4	-	-	216.0	50.0
7. Color of bill	Flesh	Flesh	Flesh	Flesh	Black	Black
General Characteristics						
1. Body temperature	104.4	103.8	102.8	100.6	101.1	100.4
2. Color of head & neck	Gray	White	Gray	Gray	White	White

* Immature = Up to 1 year of age
Sub-adult = 1-3 years of age
Adult = 3+ years of age

** Distal Primary

*** Wear determined from tips of primaries

**** Diameter taken at lateral dimension of Tarsus

***** This measurement made as median width in past years

1966 - WHISTLING SWAN - MORPHOLOGICAL CHARACTERISTICS AND OBSERVATIONS

Bird No.	66-33	66-34	66-35	66-36	66-37	66-38
Band Number	509-20557	509-20558	509-20559	509-20560	509-20561	509-20562
Date	11/10/66	11/10/66	11/10/66	11/10/66	11/10/66	11/10/66
Total Weight (lbs. - oz.)	15-8	15-4	16-4	15-5	12-0	15-0
Age *	Adult	Adult	Adult	Adult	Immature	Adult
Sex	Female	Female	Male	Male	Female	Female
Bursa of Fabricus	Absent	Absent	-	-	Present	Absent
1. Depth (mm)	-	-	-	-	11	-
Oviduct	Open	Open	-	-	Closed	Open
Penis						
1. Diameter (mm)	-	-	6.0	4.0	-	-
2. Length (mm)	-	-	19.5	11.9	-	-
3. Small & Corkscrew	-	-	No	No	-	-
4. Sheathed	-	-	Yes	Yes	-	-
5. Color (pink)	-	-	No	No	-	-
6. Appearance (Wrinkled)	-	-	Smooth	Smooth	-	-
Sphincter Muscle						
1. Diameter (mm)	16.4	-	16.6	16.6	16.0	14.6
2. Shape	Flat	Convex	Convex	Convex	Flat	Convex
3. Color (flesh pink)	Yes	Yes	Yes	Yes	Yes	No
Wing & Primary Feathers						
1. Wing length (cm)	46.5	48.0	47.5	47.0	40.0	48.0
2. Length 1st primary (cm) **	41.0	31.0	35.5	39.0	35.5	38.0
3. Max. width 1st primary (mm) *****	16.0	27.1	21.3	-	23.1	24.4
4. Wear 1st primary ***	Obtuse	Obtuse	Obtuse	Obtuse	Obtuse	Obtuse
Spur Wing						
1. Feathered or bare	Feathered	Feathered	Feathered	Feathered	Feathered	Feathered
2. Knobby or smooth	Knobby	Knobby	Knobby	Knobby	Knobby	-

Bird No.	66-33	66-34	66-35	66-36	66-37	66-38
Breast & Belly Feathers						
1. Average width (mm)	-	-	-	-	-	-
Tail Feathers						
1. No. Rectrices	-	-	-	-	-	-
2. Notched Rectrices	Unnotched	Unnotched	Unnotched	Unnotched	Unnotched	Unnotched
3. Length longest rectrice (mm)	15.0	15.5	17.5	17.5	12.3	12.3
4. Median width vane of longest rectrice (mm)	18.0	-	19.1	22.0	15.0	13.4
The Legs						
1. Diam. Tarsus mid-point (mm) ****	20.9	21.4	24.2	22.0	21.4	-
2. Total length Tarsus (mm)	11.1	10.3	11.3	10.2	9.8	-
The Bill						
1. Total length (mm)	88.0	93.2	100.4	93.2	89.0	91.0
2. Width of bill at nostrils (mm)	31.3	33.2	34.5	32.2	30.5	32.2
3. Width of nail (mm)	22.2	23.4	18.6	18.4	21.8	18.5
4. Distance of nostril from tip of bill (mm)	42.6	45.2	46.3	42.7	39.6	35.9
5. Yellow spot in lore	Present	Present	Present	Present	Absent	Present
6. Area of yellow spot (mm^2)	160.0	142.5	527.0	102.9	-	154.9
7. Color of bill	Black	Black	Black	Black	Flesh	Black
General Characteristics						
1. Body temperature	101.2	101.2	101.2	-	-	-
2. Color of head & neck	White	White	White	White	GRay	White

* Immature = Up to 1 year of age
Sub-adult = 1-3 years of age
Adult = 3+ years of age

** Distal Primary

*** Wear determined from tips of primaries

**** Diameter taken at lateral dimension of Tarsus

***** This measurement made as median width in past years

1966 - WHISTLING SWAN - MORPHOLOGICAL CHARACTERISTICS AND OBSERVATIONS

Bird No.	66-39-	66-40	66-41	66-42	66-43	66-44
Band Number	509-20563	509-20564	509-20565	509-20566	509-20567	509-20568
Date	11/10/66	11/10/66	11/10/66	11/10/66	11/10/66	11/10/66
Total Weight (lbs. - oz.)	12-8	11-12	14-12	10-8	13-8	14-8
Age *	Immature	Adult	Adult	Immature	Immature	Adult
Sex	Female	Female	Female	Female	Female	Female
Bursa of Fabricus	-	Absent	Absent	Present	Present	Present
1. Depth (mm)	-	-	-	10	10	-
Oviduct	Closed	Open	Open	Closed	Closed	Open
Penis						
1. Diameter (mm)	-	-	-	-	-	-
2. Length (mm)	-	-	-	-	-	-
3. Small & Corkscrew	-	-	-	-	-	-
4. Sheathed	-	-	-	-	-	-
5. Color (pink)	-	-	-	-	-	-
6. Appearance (Wrinkled)	-	-	-	-	-	-
Sphincter Muscle						
1. Diameter (mm)	17.2	9.5	17.0	-	6.2	17.5
2. Shape	Flat	Convex	Convex	Flat	Convex	Flat
3. Color (flesh pink)	No	Yes	Yes	Yes	Yes	Yes
Wing & Primary Feathers						
1. Wing length (cm)	44.5	44.0	44.5	42.5	44.5	42.0
2. Length 1st primary (cm) **	31.5	34.0	31.5	32.5	33.0	33.5
3. Max. width 1st primary (mm) *****	27.5	26.3	27.0	27.0	23.7	-
4. Wear 1st primary ***	Obtuse	Obtuse	Obtuse	Obtuse	-	Obtuse
Spur Wing						
1. Feathered or bare	Feathered	Feathered	Feathered	Feathered	Feathered	Feathered
2. Knobby or smooth	Knobby	Smooth	Knobby	smooth	smooth	Knobby

Bird No.	66-39	66-40	66-41	66-42	66-43	66-44
Breast & Belly Feathers						
1. Average width (mm)	-	-	-	-	-	-
Tail Feathers						
1. No. Rectices	-	-	-	-	-	-
2. Notched rectrices	Notched	Unnotched	Unnotched	Notched	Notched	Unnotched
3. Length longest rectrice (cm)	12.1	14.5	14.5	11.4	13.0	-
4. Median width vane of longest rectrice (mm)	18.2	18.2	22.0	15.0	18.4	-
The Legs						
1. Diam. Tarsus mid-point (mm) ****	21.2	21.4	23.6	22.7	19.4	22.0
2. Total length Tarsus (mm)	10.7	9.9	11.2	9.2	9.5	10.3
The Bill						
1. Total length (mm)	90.9	83.3	91.5	84.0	88.9	86.3
2. Width of bill at nostrils (mm)	32.7	31.5	32.8	30.8	31.1	32.6
3. Width of nail (mm)	19.1	16.6	-	21.0	18.8	19.8
4. Distance of nostril from tip of bill (mm)	40.3	42.1	41.9	41.0	41.1	41.2
5. Yellow spot in lore	Absent	Present	Present	Absent	Absent	Present
6. Area of yellow spot (mm^2)	-	144.8	199.5	-	-	170.0
7. Color of bill	Flesh	Black	Black	Flesh	Flesh	Black
General Characteristics						
1. Body temperature	-	-	101.3	104.4	102.0	102.0
2. Color of head & neck	Gray	White	White	Gray	Gray	White

* Immature = Up tol year of age
Sub-adult = 1-3 years of age
Adult = 3+ years of age

** Distal Primary

*** Wear determined from tips of primaries

**** Diameter taken at lateral dimension of Tarsus

***** This measurement made as median width in past years

1966 - WHISTLING SWAN - MORPHOLOGICAL CHARACTERISTICS AND OBSERVATIONS

Bird No.	66-45	66-46	66-47
Band Number	509-20569	509-20570	509-20571
Date	11/10/66	11/10/66	11/10/66
Total Weight (lbs. - oz.)	15-0	15-0	14-0
Age *	Adult	Adult	Adult
Sex	Male	Female	Female
Bursa of Fabricus	-	Absent	Absent
1. Depth (mm)	-	-	-
Oviduct	-	Open	Open
Penis			
1. Diameter (mm)	-	-	-
2. Length (mm)	-	-	-
3. Small & Corkscrew	No	-	-
4. Sheathed	Yes	-	-
5. Color (pink)	No	-	-
6. Appearance (Wrinkled)	Yes	-	-
Sphincter Muscle			
1. Diameter (mm)	-	20.0	20.0
2. Shape	Flat	Flat	Convex
3. Color (flesh pink)	Yes	Yes	Yes
Wing & Primary Feathers			
1. Wing length (cm)	47.0	48.5	45.5
2. Length 1st primary (cm) **	36.6	35.5	33.5
3. Max. width 1st primary (mm) *****	22.2	22.8	17.7
4. Wear 1st primary ***	Obtuse	Obtuse	Obtuse
Spur Wing			
1. Feathered or bare	Feathered	Feathered	Feathered
2. Knobby or smooth	Smooth	Knobby	Smooth

Bird No.	66-45	66-46	66-47
Breast & Belly Feathers			
1. Average width (mm)	-	-	-
Tail Feathers			
1. No. Rectrices	-	-	-
2. Notched rectrices	Unnotched	Unnotched	Unnotched
3. Length longest rectrice (cm)	-	16.5	15.2
4. Median width vane of longest rectrice (mm)	-	16.0	20.0
The Legs			
1. Diam. Tarsus mid-point (mm) ****	23.0	21.5	23.8
2. Total length Tarsus (mm)	11.0	10.0	10.1
The Bill			
1. Total length (mm)	86.9	91.7	90.8
2. Width of bill at nostrils (mm)	31.3	33.1	32.5
3. Width of nail (mm)	19.7	21.3	20.7
4. Distance of nostril from tip of bill (mm)	38.7	49.6	40.5
5. Yellow spot in lore	Present	Present	Present
6. Area of yellow spot (mm^2)	162.0	407.7	240.0
7. Color of bill	Black	Black	Black
General Characteristics			
1. Body temperature	104.0	-	-
2. Color of head & neck	White	White	White

* Immature = Up to 1 year of age
Sub-adult = 1-3 years of age
Adult = 3+ years of age

** Distal Primary

*** Wear determined from tips of primaries

**** Diameter taken at lateral dimension of Tarsus

***** This measurement made as median width in past years

By the second week of March, Whistling swans have moved into the refuge area with peak populations building up to 2000 in late March to the first two weeks of April. The majority of the birds have left the refuge by mid to late April.

During the four year period, the preferred feeding areas have been flooded agricultural crop fields. Nearly all of the crops grown were utilized to some degree with corn and small grain providing the bulk of feeding activity. Flooded fields have been preferred over the past years but feeding and loafing has been observed on unflooded fields. Loafing occurred in pool areas with little feeding noted.

The number of birds using the refuge during the spring migration has generally increased. Whether this represents an increase in the overall population or an alteration in the migration pattern is not known.

Swans frequently pass through the Saginaw Valley during the fall migration. During the study period to date, only in the fall of 1966 have any stopped on the refuge in any numbers. These arrived on November 5, and peaked at 350 shortly after. The majority had gone following a 1½ week stay.

Current refuge farming operations and associated pool development have appeared to correlate with swan preferences for feeding and loafing areas. Flooded fields habitually occur each spring with sufficient feeding and loafing area available for current swan use.

Direct competition between swans and other species of waterfowl has been limited. The swans have been somewhat intolerant to these other species and either utilize areas on the periphery of these groups or move away to new areas altogether. Ample food and space for present waterfowl use exists to date. To what degree competition would increase under limited food and space conditions has not been fully demonstrated during the study.

During the four years of the study, eighty swans have been captured. This is shown in a break-down by years in the following table.

Capture Results - Whistling Swans

Year	Number Captured
1963	11
1964	18
1965	0
1966	51

Cannon net trapping has been most successful to date, capturing 49 birds or 61.2% of the total. Cage traps have yielded 31 birds or 38.8%. Success of the two traps has been affected to a great degree by environmental conditions on the area. High water has hampered use of cage traps during some periods while at other times birds refuse to use cannon net trap sites, preferring to feed in fields. Both methods have merit and will be continued.

The method of marking and banding has proved satisfactory. Birds are easily visible and the procedure is completed with relative ease. Fall marking of birds should produce the best chance for observation since birds will retain the color for a longer period prior to molting.

Observations of marked swans to date are summarized as follows:

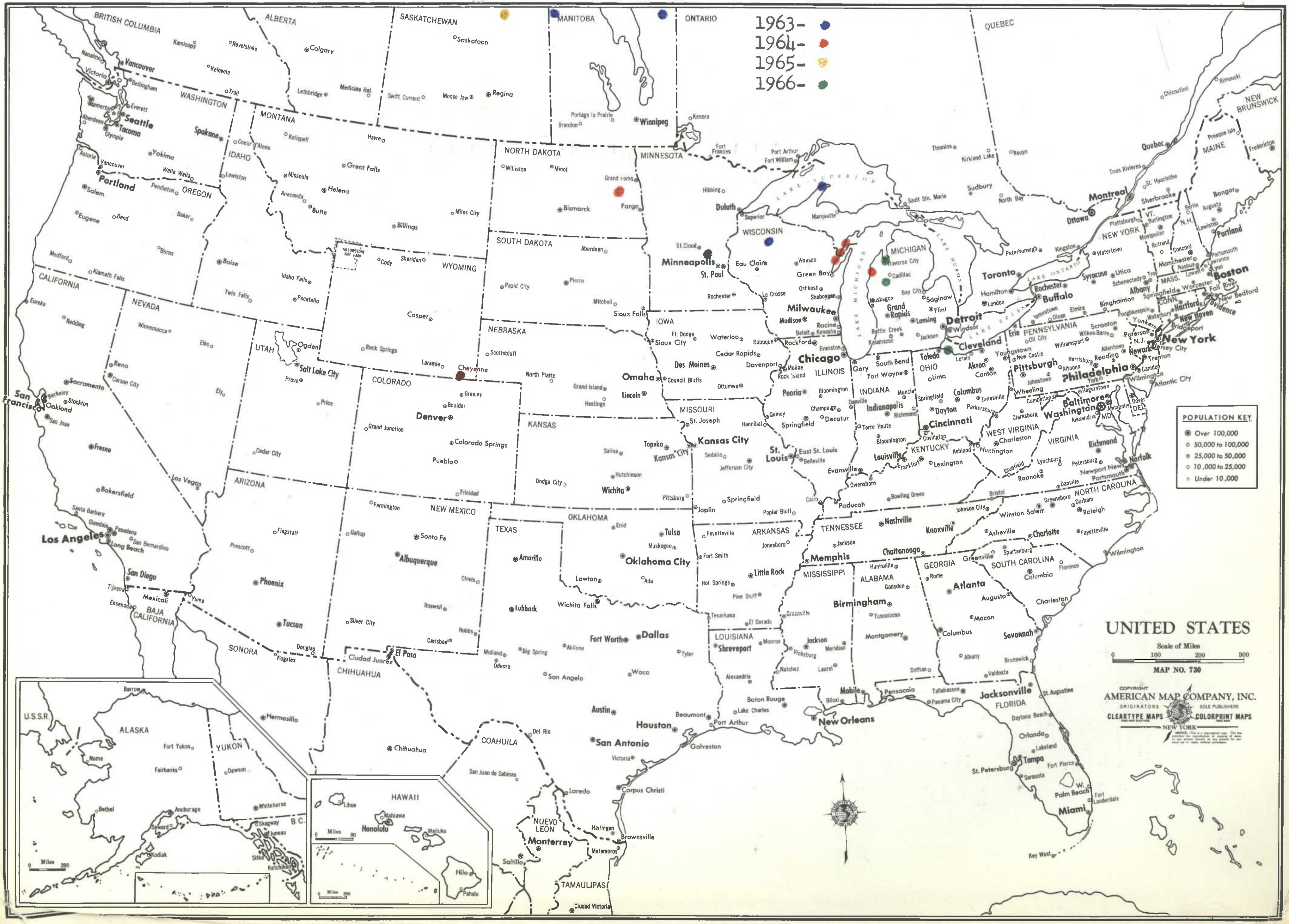
Observation No.	Dates Observed	Location
1963-1	April 23	Eagle Harbor, Mich. (on Lake Superior)
1963-2	April 17	Musky Bay of Lac Court O'Reilles, Wisc.
1963-3	April 16	Carrot River, Manitoba
1963-4	April 24	Cypress River, Manitoba
1964-1	April 12	Ingallston, Michigan (Menominee Co.)
1964-2	April 12	Manistee Lake, Filer City, Michigan
1964-3	April 12	Peshtigo Harbor, Wisconsin
1964-4	April 18	Oconto County, Wisconsin
1964-5	April 25	Pole Creek Reservoir, Cheyenne, Wyoming
1964-6	May 4	Sibley Lake NWR, North Dakota
1965-1	May 5	Nipawan, Saskatchewan, Canada
1966-1	April 20	Bordman River, Traverse City, Michigan
1966-2	April 24	Sherburne NWR, Minnesota
1966-3	April 25	Wexford County, Michigan
1966-4	December 13 & 14	Ottawa NWR, Oak Harbor, Ohio

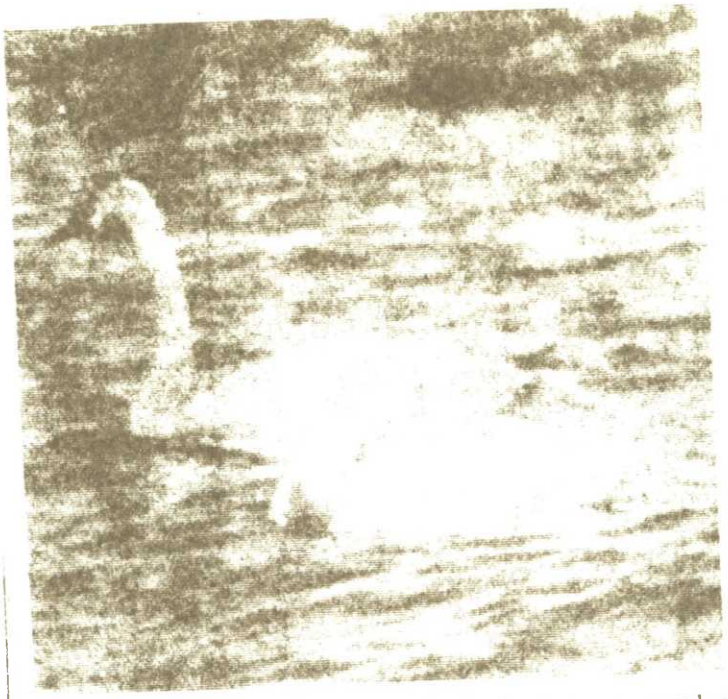
The above sightings are plotted on Map 4. To date no sightings have been recorded from either wintering or breeding grounds. Insufficient returns allow only speculative impressions to be drawn from the above data.

One band return has been received. A swan banded at Shiawassee Refuge as an immature female on April 8, 1964, was retrapped on August 4, 1965 at Snake River, Northwest Territories, Canada.

In order to obtain a more meaningful sample, generalizations concerning morphological characteristics will be made at the termination of the study.

OBSERVATION LOCATIONS OF ISTLING SWANS MARKED DURING SH ASSEE STUDY PROJECT NO. 1





THE HUGE BIRD that settled down on a pond at the Ray Zeroth farm last week was a whistling swan of the species pictured above. The bird has a wingspread of approximately seven feet.

Whistling Swan Spends Week on Ray Zeroth Farm

A color-marked whistling swan was present on a pond on the Ray Zeroth farm about five miles west of Princeton from April 24 to April 30. The bird was reported to State Warden Dick Simmons who, in turn, guided several parties out to see the bird.

Whistling swans are large birds with a 7-foot wingspread and normally have pure, white plumage. This bird was painted pink on the neck and back and had a yellow plastic collar around its neck. When it stood on the ground one could see the metal band on the left leg and the yellow plastic band on the right leg.

Investigation revealed this bird had been captured, banded and color-marked on the Shiawassee national wildlife refuge near Saginaw, Mich., on April 4, 1966. This meant the bird had flown over 559 air miles in 20 days to get here. It still has a long way to go since these birds nest in the arctic regions of Canada. Their wintering location is the Chesepeake Bay area in Maryland which means an annual round trip of over 6,000 miles.

It is an interesting coincidence that this swan should fly from one national wildlife refuge to the immediate vicinity of another. The Zeroth farm is only 2½ miles north of the Sherburne national wildlife refuge.

Eighteen sick, dead, or injured swans have been observed during the study period to date. Of those found, lead poisoning was indicated in five birds. Exhaustion during handling of captured birds resulted either directly or indirectly in the loss of three birds. For lack of more detailed information, no conclusions concerning mortality will be made at this time. The following table will show mortality, disease and injury encountered over the four year period.

Mortality, Disease, and Injury

Year	Number	Cause
1963	0	
1964	3	Unknown
1965	3	Lead poisoning indicated
	1	Fractured wing tip
1966	4	Unknown
	2	Lead poisoning indicated
	1	Trampled during capture
	1	Injured wing - gunshot
	3	Found in weakened condition following capture - subsequently died or killed by carnivore

In order to obtain the most meaningful data possible, study projects similar in nature to the above should be initiated in other areas to correlate the data on a larger scale. The above is an effort to assemble the data to date in order to see if the study is fulfilling the objectives as set forth in the study outline. At the termination of the study, a complete report will be prepared to include all results obtained during the five year period.

C. Marsh Transect Survey.

Nine line intercept transects established in 1964 according to the line intercept method proposed by Dr. W. Green in "Suggested Procedure for Sampling Vegetation" were used by Wildlife Aid Bellinger. The transects were completed during August following established techniques.

Data accumulated from this study over a period of years will provide information upon which to base future water management plans to produce desired marsh and aquatic vegetation complex. The data were collected, recorded and summarized by Wildlife Aid Bellinger and placed in the refuge files.

D. Banding.

The duck banding program was initiated in early July when Wildlife Aid Bellinger set out floating traps in Pool 2 and at several locations along the Ferguson Bayou to capture Wood Duck broods. Pool 1 was dry for flood damage repairs and habitat improvement work and this restricted use of floating traps to the above locations. Cannon net trapping sites were prepared in Pools 1a and 1b, and a "Colorado" trap was constructed in Pool 1a prior to reflooding.

During the summer and early fall months, duck trapping success was poor due to carp activity in the pools and difficulty in baiting ducks to the net trap sites. Activity picked up in October and most of the ducks banded were taken late in the fall.

Canada goose banding was most active in March and again in the fall months when the migrant populations were present. All geese were taken with cannon net traps in Pool 1. The annual drive to band the years goslings was conducted on June 16 with excellent results as nearly 80% of the 1966 goslings were captured and banded in two drives in Farm Unit 121.

Whistling swans were trapped during the spring migration using swim-in traps and the cannon net trap. In November, a lucky break enabled us to trap 37 swans at the Pool 1b cannon net trap.

Total bandings in 1966 included 1977 ducks, 598 Canada geese, and 49 Whistling swans. Complete banding totals are included on the following Banding Summary and Cost Record.

VI. PUBLIC RELATIONS

A. Recreational Uses.

Public demand for recreational facilities continued to increase during 1966 as more and more people discovered the refuge for the first time. Literally thousands of people descended on the refuge in the spring months to take advantage of the guided automobile tours offered on week-ends during the peak of the waterfowl migration period. On the Sundays when the weather was pleasant, it was a physical impossibility to handle all the carloads of sight-seers on the tour route. It was estimated that more than 700 cars tried to enter the area on the last Sunday in March. We had the loan of a traffic counter from Saginaw County Road Commission on Sunday, April 3. This was a cold, rainy and windy day, but a total of 329 cars was counted between 3:00 P.M. and 7:00 P.M.

In conjunction with the designation of the refuge as a "Fee Area" under the "Land and Water Conservation Act", it was necessary to furnish some sort of facilities for recreation. A nature trail of about 5 miles in length was developed in May and opened to the public during June. Use

SUMMARY OF BANDINGS

Banding Area **Shiawassee NWR** Period of Operation **[M]arch 28 - November 7, 1955**

AOU No.	Species	Age and Sex*									Total
		LOCAL			IMMATURE			ADULT			
		M	F	?	M	F	?	M	F	?	
132	Mallard	10	14		439	495		305	345		1509
133	Black Duck	1			58	95		54	34		253
137	Pintail					2			1		3
139	Green-winged Teal				2	1		2			5
140	Blue-winged Teal	1			1			2	4		8
143	American Widgeon								4		4
144	Wood Duck	29	32		7	5		9	10		93
147	Canvasback							1			1
149	Lesser Scaup							1			1
	Sub-total	41	45		507	500		385	398		1977
219	Common Gallinule						2				2
221	American Coot						24			35	59
315	Mourning Dove				4	4	5	12	5	9	40
	Sub-total				4	4	31	12	5	44	101
172	Canada Goose	80	74		85	95		115	148		598
180	Whistling Swan				1	22		8	18		49
TOTAL		121	120		597	721	31	521	570	44	2725

*Enter age in column headings as Nestling; Local, Immature, Sub-adult, Adult. Indicate number and type of traps or methods used: 9 Walk-in bait; 2 Swim-in bait; 3 Cannon nets; ____ Mist nets; ____ Daytime drive traps; 2 Night-time traps; ____ Night-lighting units; ____ Other (specify)

Kind of bait used, if any: **Shelled corn and barley.**

BANDING SUMMARY AND COST RECORD

Side 1

BANDING COST RECORD

1. Total man-hours spent on banding:

300	@ $ 3.92	= $ 1176.00		
100	@ $ 2.30	= $ 230.00		
	@ $	= $		
	@ $	= $		
		Total		$ 1406.00

2. Vehicle miles driven on banding: 400 @ $.06 (handling) $ 24.00

3. Bait used: 500 bushels or lbs. @ $ .10 $ 50.00

4. Miscellaneous other costs (shells for cannons, transportation of bait, wire, minor repairs to traps, nets, or cannons, etc.) List:

Cannon shells - 160 @ .72	$115.20
Setting up nets, traps, etc.	100.00

$ 215.20

5. Depreciation of equipment:

Cannons and nets ($700.00 x 1/4)	$175.00
1 roll welded wire	30.00

$ 205.00

6. Total Costs $ 1920.00

Remarks:

131	ducks trapped in bait traps using 90 hours labor @2.30	207.00
1845	ducks trapped in cannon-net traps using 120 hours labor @ 3.92	470.40
154	geese trapped in drive trap using 30 hours labor @ 3.92	117.60
444	geese trapped in cannon-net traps using 120 hours labor @ 3.92	470.40
8	swans trapped in swim-in traps using 10 hours labor @ 3.92	39.20
41	swans trapped in cannon-net traps using 20 hours labor @ 3.92	78.40
40	doves trapped in cage traps using 10 hours labor @ 2.30	23.00

(Most of labor was donated time and cost Gov't nothing)

Bander: John R. Frye, Refuge Manager

Date: November 17, 1966

of the trail far exceeded our estimates and has been welcomed by the public. Some problems have occurred when certain individuals attempted to drive the narrow dike-top trail designed for foot travel only. In addition to the trail, a small area was cleared and seeded to grass at the end of Evon Road at the Ferguson Bayou for use as a picnic area. Two refuge constructed picnic tables were cemented in place to complete this limited development. It is planned to add more tables and a few picnic grills to this area in 1967.

Public fishing activity was normal and several sites along the various rivers received daily use by small numbers of fishermen throughout the year.

Boy Scouts and Girl Scouts groups held several hiking and overnight camping excursions within the refuge during the summer months. A special use permit was issued to the Saginaw Bay Area Council, Boy Scouts of America, to develop and maintain a camp site on the island at the junction of the Shiawassee and Tittabawassee Rivers. Initial development was completed late in the summer and the island was used extensively by local scout troops through the fall months.

Robert F. Sisson, Staff Photographer for National Geographic Society, spent two weeks at Shiawassee in late March and early April to photograph the swan marking project. This is to be included with a feature on the National Wildlife Refuge System scheduled for publication in the National Geographic Magazine early in 1967.

B. Refuge Visitors.

Date	Name	Affiliation	Purpose
Jan. 3	George Berkeris	FWS, Realty, R.O.	Rental Surveys
11	Mogen Nielsen	MCD, Lands, Lansing, Mich.	Visit
14	George Hunt	U of M, Ann Arbor, Mich.	Proposed study
14	David Weaver	U of M, Ann Arbor, Mich.	Proposed study
18	Paul Kay	MCD, Lands, Lansing, Mich.	Acquisition
Feb. 1	Gerald Falls	GSA, Detroit, Michigan	Excess property
2	Cleve M. Orler	City of Saginaw	Flood Control Project
8	Ralph Dush	Michigan Sugar Company	Visit
14	John Hakala	FWS, Seney Refuge	Student interviews
14	G. Buterbaugh	Jordan River NFH	Student interviews
25	Doug Miller	ASCS, Saginaw County	Farm program
Mar. 3	John Gray	Austin Powder Co., Monroe	Blasting supplies
15	James Halm	4-H, Saginaw County	4-H tour plans
15	Ben Wallace	SCS, Saginaw, Michigan	4-H tour plans
17	Miles Pirnie	M.S.U., East Lansing, Mich.	Photography
25	Marv Johnson	MCD, Rose Lake, Michigan	Public hunting, etc.
25	H. Dykema	MCD, St. Charles, Mich.	Public hunting, etc.
25	Nels Johnson	MCD, Lansing, Michigan	Public hunting, etc.

Date	Name	Affiliation	Purpose
Mar. 29-			
Apr. 11	Robert Sission	National Geographic Society	Photography
5	Ladd Carlleton	WJRT-TV 12, Flint, Mich.	Photos and story
11	Irene Russell	Girl Scouts	Visit
11	Susan Volker	Girl Scouts	Visit
May 18	Ladd Carlleton	WJRT-TV 12, Flint, Mich.	Photos and story
18	Andy Ammon	MCD, Lansing, Michigan	Woodcock survey
June 29	Harold Burgess	Squaw Creek NWR	Visit
July 27	Gerald Falls	GSA, Detroit, Michigan	Excess property
13 - 15	John Winship	FWS, Refuges, R.O.	Aerial photos
Aug. 10	George Orlich	Seney Refuge, FWS	Equipment transfer
24	Christine Born	Bay City Times	Story
24	Elmer Pincombe	Bay City Times	Photography
30	Miles Pirnie	M.S.U. East Lansing, Mich.	"Waterfowl Talk"
30	Darryl Wilson	M.S.U. East Lansing, Mich.	" "
Sept 15	Ray Jenson	FWS, Engineering, R.O.	Development plan
15	Tom Reed	FWS, Engineering, R.O.	Development plan
Oct. 7	Robert Young	Spaulding Twp. Supervisor	Visit
12	R. Boehringer	U. S. Probation Officer	Refuge violations
13	Gerald Falls	GSA, Detroit, Michigan	Excess property
17	Dr. Tordoff	U of M, Ann Arbor, Mich.	Visit
17	John R. Akin	FWS, RBS, Lebanon, Ohio	Visit
20 - 21	Anthony Inglis	FWS, Patuxent W. R. C.	Water Pollution Study
31	John Jones	BSFW Safety Officer, C.O.	Visit
31	Walt Ettlemen	BSFW Job Corps Spec., C.O.	Visit
31	Frank R. Martin	FWS, Refuges, R.O.	Visit
Nov. 3	Clair Rollings	FWS, Refuges, R.O.	Soil & Moisture
15	William Bair	Ottawa Refuge, FWS	Corn transfer
22	Marv Johnson	MCD, Rose Lake, Michigan	Goose hunting
23	Doug Webb	MCD, Rose Lake, Michigan	Visit
Dec. 6	Harold Dykema	MCD, St. Charles, Michigan	Waterfowl use
7	Joe Richie	FWS, Engineering, R.O.	Examine Equip. Bldg.
6 - 7	George Orlich	FWS, Seney Refuge	Corn & equip. transfer
6 - 7	Jr. Losey	FWS, Seney Refuge	Corn & equip. transfer
12 - 13	Bill Anderson	FWS, Seney Refuge	Corn transfer
12 - 13	Frank McAnear	Dept. of Justice, Washington	Land condemnation
12 - 13	Ed Larie	BOR, Ann Arbor, Michigan	Land condemnation
19	Ben Wallace	SCS, Saginaw, Michigan	Visit
19	Raymond Jaenicke	Saginaw County Drain Comm.	Visit
19	H. Steffin	SCS, Saginaw, Michigan	Visit
20	Jr. Losey	FWS, Seney Refuge	Corn transfer

Frequent refuge visitors during the year included farming cooperators, Michigan Conservation Department Conservation Officer John Harris, and Soil Conservation Service personnel from Saginaw.

C. Refuge Participation.

1. Refuge Tours.

March 26 - Midland Boy Scout Troop. (Frye & Anderson)

27 - Public Refuge Tour. (Frye & Anderson)

April 6 - Cub Scout Pack 5. (Poma)

11 - Junior Girl Scouts. (Anderson)

12 - Cub Scout Pack 79. (Poma)

12 - Our Lady High School Biology Class. (Poma)

14 - Senior Citizens Club. (Frye)

14 - Cub Scout Pack 53. (Frye & Anderson)

15 - Jewitt School 4, 5, 6, 7th Grades. (Poma)

15 - Cub Scout Pack 3226. (Anderson)

25 - Mackinaw Middle School 6th Grade. (Frye & Anderson)

26 - Cub Scout Pack. (Frye & Anderson)

May 5 - Cub Scout Pack 79. (Robinson)

11 - 4-H Group. (Frye & Anderson)

25 - Bangor Jr. High School. (Anderson & Poma)

25 - Boy Scout Troop 99. (Poma)

June 28 - North Intermediate School. (Frye)

July 8 - Webber School. (Poma)

August 24 - Miss Born, Bay City Times. (Frye)

September 16 - Bridgeport School 6th Grade. (Poma)

October 6 - Girl Scout Troop 69. (Poma & Mayle)

10 - Dr. George Hunt and University of Michigan Waterfowl Class. (Frye & Kerschbaum)

12 - Potter School 4th Grade. (Poma & Kerschbaum)

October 12 - Herig School 6th Grade. (Poma & Kerschbaum)

18 - Chester Miller School 5th Grade. (Frye)

19 - Girl Scout Troop 22. (Kerschbaum)

20 - South Elementary School. (Kerschbaum)

21 - Brucker School 4th & 5th Grades. (Kerschbaum)

21 - Anthony Inglis, Patuxent W. R. C. (Robinson)

24 - Chippewa Middle School. (Kerschbaum)

25 - Douglas MacArthur High School. (Kerschbaum, Poma Robinson and Mayle)

26 - Plainfield School. (Poma)

29 - YMCA Indian Guides. (Frye & Kerschbaum)

29 - Central Michigan University Teacher's Workshop. (Frye & Kerschbaum)

November 7 - Girl Scout Troop. (Poma)

12 - Cass City Boy Scout Troop. (Frye)

2. Meetings.

January 24-28 - Frye and Anderson attended Regional Conference in Minneapolis.

25 - Poma attended Annual Soil Conservation District Meeting in Saginaw.

February 1 - Frye and Anderson conducted meeting for all refuge farming cooperators.

2 - Frye and Anderson conducted meeting and slide talk for persons involved in condemnation proceedings and interested in farming under Bureau program.

March 2 - Ray Vasold, County Extension Agent, conducted meeting for all farming cooperators. Soil tests and fertilizer recommendations were discussed.

April 12 - Frye attended Saginaw Valley Flood Control Meeting at Saginaw County Courthouse.

June 3 - Frye and Poma attended GSA Supply Conference in Detroit.

10 - Frye attended Neighborhood Youth Corps Meeting in Saginaw.

14-15 - Frye attended Goose Management Seminar held at Seney National Wildlife Refuge.

July 29 - Frye attended a meeting of the Equal Employment Opportunity Committee in Bay City, Michigan.

August 30 - Frye attended a second meeting of the Equal Employment Opportunity Committee at the V. A. Hospital in Saginaw.

September 8 - Frye attended a meeting of Federal and State project leaders concerning law enforcement problems held at Roscommon, Michigan.

13-15 - Kerschbaum attended New Employee's Orientation at Regional Office in Minneapolis.

28 - Kerschbaum, Poma, Robinson and Mayle attended Law Enforcement Officer's meeting at Rose Lake Experiment Station.

October 4 - Frye attended United Fund meeting for Federal Agencies in Saginaw.

November 30 - Frye attended Spaulding Township Planning Commission meeting.

Monthly meetings of the Saginaw County Agricultural Council were attended by Frye and Anderson. Frye acted as vice-president during 1966 and was elected president for 1967. Periodic informal meetings with the Soil Conservation Service, Cooperative Extension Service, and farming cooperators were held throughout the year.

3. Slide Talks.

February 7 - Harvey Kaufman School P.T.A. - Boy Scouts. (Frye)

14 - University of Michigan Wildlife Management Seminar, Ann Arbor, Michigan. (Frye & Hakala)

15 - Michigan State University Fisheries & Wildlife Club, East Lansing, Michigan. (Frye & Hakala)

March 7 - Cub Scout Roundtable, Sheridan Avenue Methodist Church. (Poma)

21 - Boy Scout Troop, Midland, Michigan. (Frye)

27 - Lawndale Home Economics Club, Frankenmuth, Michigan. (Anderson)

April 28 - Bridgeport Jr. High School - 8th Grade Science Classes. (Frye)

May 6 - Hess School 1st and 2nd Grades. (Poma)

13 - Jackson Audubon Club. (Frye)

June 27 - North Intermediate School 6th & 7th Grades. (Poma)

July 7 - Webber School 7th and 8th Grades. (Frye)

27 - Spaulding Township Planning Commission. (Frye)

September 13 - Bay City Jr. Chamber of Commerce. (Frye)

25 - Children of the American Revolution. (Kerschbaum)

October 11 - Saginaw Women's Club. (Frye)

19 - Bridgeport Jr. Chamber of Commerce. (Kerschbaum)

December 5 - Zilwaukee Lions Club. (Frye)

27 - Saginaw Breakfast Optimist Club. (Frye)

4. Student Interviews.

Frye conducted student interviews for summer laborer positions on February 11 at Saginaw High School.

Frye, Hakala (Seney Refuge), and Buterbaugh (Jordan River N.F.H.) conducted student interviews February 15 at the University of Michigan and February 16 at Michigan State University.

Frye conducted student interviews for summer Forestry Aid position at Seney Refuge and Necedah Refuge at University of Michigan and Michigan State University on February 25 and 28 respectively.

5. Other.

Radio. A five minute radio program on WKNX and a 90 second program on WSGW were presented every two weeks throughout the year with Frye, Anderson, Poma, and Kerschbaum alternating.

Television. Refuge activities were presented during four news telecasts in April over Station WJRT in Flint, on film. Subjects of the films made at the refuge by newsman Ladd Carllton included spring concentrations of waterfowl featuring an interview with Assistant Manager Anderson; goose banding; swan trapping and marking; and a discussion on the "Golden Passport" featuring an interview with Manager Frye.

Ed Anderson coached a little league baseball team comprised of township boys during the summer; Poma continued service as a Committeeman for a Cub Scout Pack; and Frye served with the Spaulding Township Volunteer Fire Department throughout the year.

D. Hunting.

The only hunting authorized on the refuge in 1966 was for deer during the Michigan gun season from November 19 through December 6, under current state and federal regulations. The open area, consisting of approximately 6,000 acres on the north and east sides of the refuge, was made up of bottomland hardwoods interspersed with agricultural lands. This year we experienced a massive influx of shotgun type deer hunters with suprising numbers of hunters from the Detroit and Flint areas. From car counts, there were an estimated 1,000 hunters using the area on each day of the opening week-end and the highest count ever on Thanksgiving Day with an estimated 1,200 hunters. During the 16 day season a computed 6,442 hunter-days produced an estimated legal kill of 150 deer, including about 50 does. Illegal kills were up considerably this year so the final kill estimate is 200.

1966 was the third and last year during which all goose hunting was prohibited in a 66,000 acre block which includes all of the refuge and the state game area. Preliminary conclusions indicate the three year closure was successful in the attempt to increase Canada goose use of the area during fall periods by reduction of the hunting pressure. The peak fall goose population again established a new record with 18,300 geese present on October 27. This represents a 50 per cent increase over the 1965 peak, and is impressive when the 1966 peak is compared to the 1963 peak goose population of 3,800.

Duck hunting pressure was again heavy early in the season at the Shiawassee River State Game Area and followed the normal pattern and tapered off to very light pressure by the end of the season. Kill data are unavailable but it is believed that hunter success was generally good, especially late in the season after the pressure was lower, and the total kill will be higher than previous seasons.

E. Violations.

At the end of 1965 there were six violations pending in Federal District Court, all of which were cases of hunting on the Refuge Closed Area during the 1965 hunting season. These were completed in November of 1966 with the following results.

Name	Violation & Date		Court Action
James Bouchey	Hunting on Refuge -	11/20/65	$50.00 -
Richard Kuxnicki	Hunting on Refuge -	11/30/65	$50.00 1 yr. probation
Frederick Morse	Hunting on Refuge -	11/27/65	$100.00 1 yr. probation
Terrell Reed	Hunting on Refuge -	11/27/65	$35.00 1 yr. probation
Joseph Rigda	Hunting on Refuge -	11/30/65	$50.00 1 yr. probation
John Beagle	Hunting on Refuge -	10/11/66	$25.00 6 mo. probation
Allen Seelman	Trespass on Refuge -	3/28/66	$25.00 1 yr. probation

At the close of this year there are an additional 31 cases pending in Federal District Court and awaiting action. These include violations for bow hunting on the refuge, hunting on refuge closed area during the deer season, and refuge trespass.

Nuisance violations of rubbish dumping and trespass with motorcycles and "Ski-Doos" have increased each year and will continue to be important problem violations. Also on the increase is destruction of refuge signs and boundary markers, especially along the refuge boundary north of the Shiawassee River with no end in sight. Not only are the signs shot full of holes, but in many instances we have found the complete sign and post removed. The only answer to this problem is increased extra duty patrol of this area.

F. Safety.

The station safety committee, Anderson, Poma, and Robinson, set up the safety meeting schedules and regular monthly safety meetings were held throughout the year as listed below. In addition all refuge personnel completed the Standard First Aid Course given by the Red Cross during the year.

January 3 - Review of past safety meetings and future procedures for 1966 conducted by Frye.

February 7 - Review of Regional safety record with special emphasis on Division of Refuges record, conducted by Anderson.

March 7 - Two films entitled "Rescue Breathing" and "Holger Nielson Method of Artificial Respiration", were arranged by Poma.

April 4 - Red Cross First Aid Course pre-empted the monthly safety meeting.

May 2 - A film "Everything to Lose" was arranged by Robinson.

June 13 - Frye and Anderson conducted an orientation to refuge safety for new summer employees.

July 11 - A film "Safe As You Think" was arranged by Shelley.

August 8 - Two films "The Why and How of Standard First Aid" and "First Aid for Common Emergencies" was arranged by Wildlife Aid Bellinger.

September 6 - Accident prevention on the job was discussed by Frye.

October 3 - The topic, seat belts, was intoduced by Frye.

November 7 - A presentation on welding safety was given by Robinson.

December 5 - First aid kits and their use on the refuge was discussed by Kerschbaum.

On the job safety discussions were held periodically throughout the year. Action completed as a result of discussion topics at regular safety meetings included replacement of all plugs on power tools with 3-prong grounded plugs; purchase and installation of seat belts in all refuge vehicles that did not have them; and purchase of four self-inflatable life jackets for use when working in boats.

There were no lost time accidents during 1966 and the station safety record now stands at 4,855 days without a lost time accident.

Kenneth Shelley, Operator General, was seriously injured in a home accident on August 30. He was working under his car when it fell off the jack, pinning him under the vehicle. He suffered broken ribs, a broken shoulder and a punctured lung, and was lucky to be alive at all. He returned to duty somewhat worse for wear after eight weeks of recuperation. Needless to say this regretable accident served to emphasize safety practices to all employees.

VII. OTHER ITEMS

A. Trips.

January 20 - Anderson and Robinson to Wurtsmith AFB, Oscoda, Michigan to pick up excess property (three "Weasel" amphibious vehicles).

January 23-29 - Frye and Anderson to Minneapolis for Regional Conference.

April 26 - Frye and Anderson to Saginaw-Gratiot State Game Area to discuss goose hunting.

May 13 - Frye to Brooklyn,Michigan for Audubon Club meeting.

June 13-15 - Frye to Seney Refuge for Canada goose seminar.

July 13-15 - Frye and Anderson with pilot Winship flew to Alpena, Thunder Bay, Michigan islands, and Wyandotte Refuge for aerial photos.

September 12 - Frye and Robinson to Lake St. Clair Refuge to put out marker buoys.

September 13-15 - Kerschbaum to Minneapolis for orientation at R.O.

September 17-18 - Frye to Lake St. Clair Refuge for law enforcement during special Teal season.

September 19 - Mayle to Seney Refuge with corn and return with lumber.

October 2-8 - Robinson all week at Horicon Refuge to assist in goose hazing project.

October 5 - Frye, Mayle, and Kerschbaum to Wyandotte refuge to put out marker buoys.

October 18 - Robinson and Kerschbaum to Lake St. Clair Refuge to check buoy line.

October 21 - Robinson to Wyandotte Refuge with Anthony Inglis for water pollution study.

December 7-8 - Kerschbaum to Seney Refuge for corn transfer.

In addition to the above, trips were made to the Detroit Tank Plant, Selfridge AFB, and Wurtsmith AFB to screen or pick up excess property items at various times during the year.

B. Personnel.

Edward W. Anderson, Assistant Refuge Manager at Shiawassee Refuge since September 1964, resigned on August 5 to accept a position with Michigan Bean Company in Birch Run, Michigan. Ed continues to live near refuge headquarters; he married a local girl on October 22 and has settled down to a quiet married life.

Matthias A. Kerschbaum E.O.D. as Assistant Refuge Manager, replacing Anderson, on August 9. Matt, a 1966 graduate of the University of Michigan, is a native of Maryland and also attended Capital University in Columbus, Ohio.

Louis D. Robinson was reclassified from his position as Heavy Duty Mechanic, Unclassified, to the position of Biological Technician, GS-6, effective March 27, 1966.

The following incentive awards were received as a result of suggestions submitted by personnel during the year:

Ed Anderson received an award of $50.00 for his suggestion that photographs of permanent refuge personnel be included with the annual narrative report. The Refuge Manual is to be amended to include this.

Louis Robinson received a cash award of $25.00 for his suggestion for improved recoil blocks for cannon net trapping at temporary sites.

Jim Mayle was awarded $15.00 for his suggestion for construction of a portable battery charger for 6-V and 12-V batteries from surplus electric motor, auto generators, etc.

C. Land Acquisition.

Although remaining refuge acreages were brought under federal control with immediate possession through condemnation action in November of 1965, little more has been accomplished since. Final action has been completed on only two of the tracts included in the condemnation in the past 13 months.

D. Photographs.

All photographs were taken with refuge equipment and processed in the refuge combination bathroom-darkroom.

E. Credits.

Frye: Sections I, III, IV, VI A, D, E, F, VII B, C, D.

Kerschbaum: Sections II, V, VI B, C, VII A.

Poma: Typing and assembly.

Acknowledgement is made of the excellent cooperation and high degree of enthusiasm of all staff personnel which made the difficult seem simple during the year.

SIGNATURE PAGE

Submitted by:

John R. Frye
(Signature)

John R. Frye

Refuge Manager
Title

Date: January 18, 1967

Approved, Regional Office:

Date: 1/20/67

Frank R. Montera
(Signature)

Regional Refuge Supervisor

Jack Frye
Refuge Manager

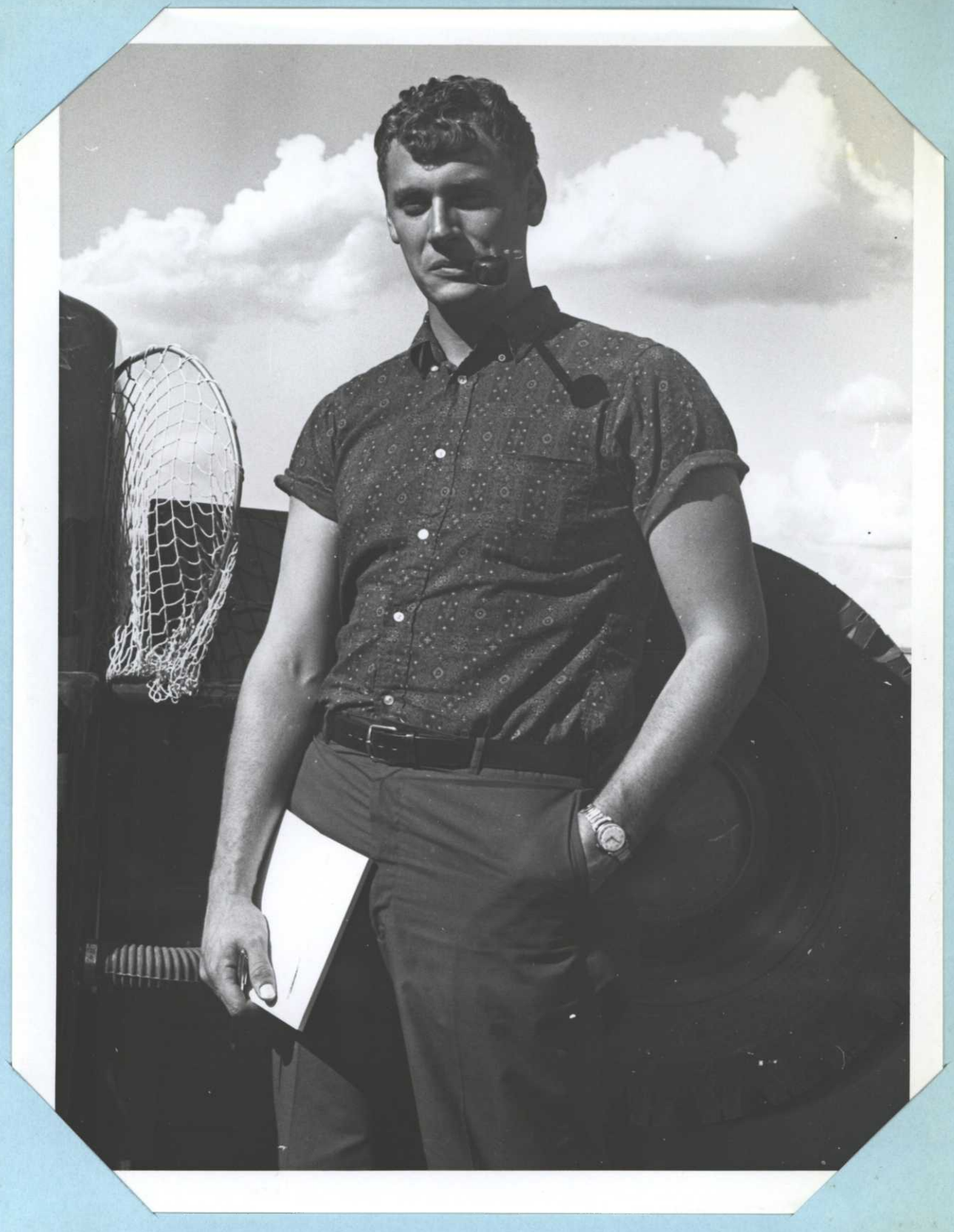
Matt Kerschbaum
Asst. Refuge Manager

Sam Poma
Refuge Clerk

Louis Robinson
Biological Technician

Jim Mayle
Operator General

Kenneth Shelley
Operator General



Jay Bellinger, student at Michigan State University, was assigned to Shiawassee Refuge as summer Wildlife Aid. Photo 55-401; 09-22-55; JRF

The first 1955 goslings hatched on island in Pool 1A. Note "runt" egg in nest.
Photo 55-189; 04-29-55; JRF

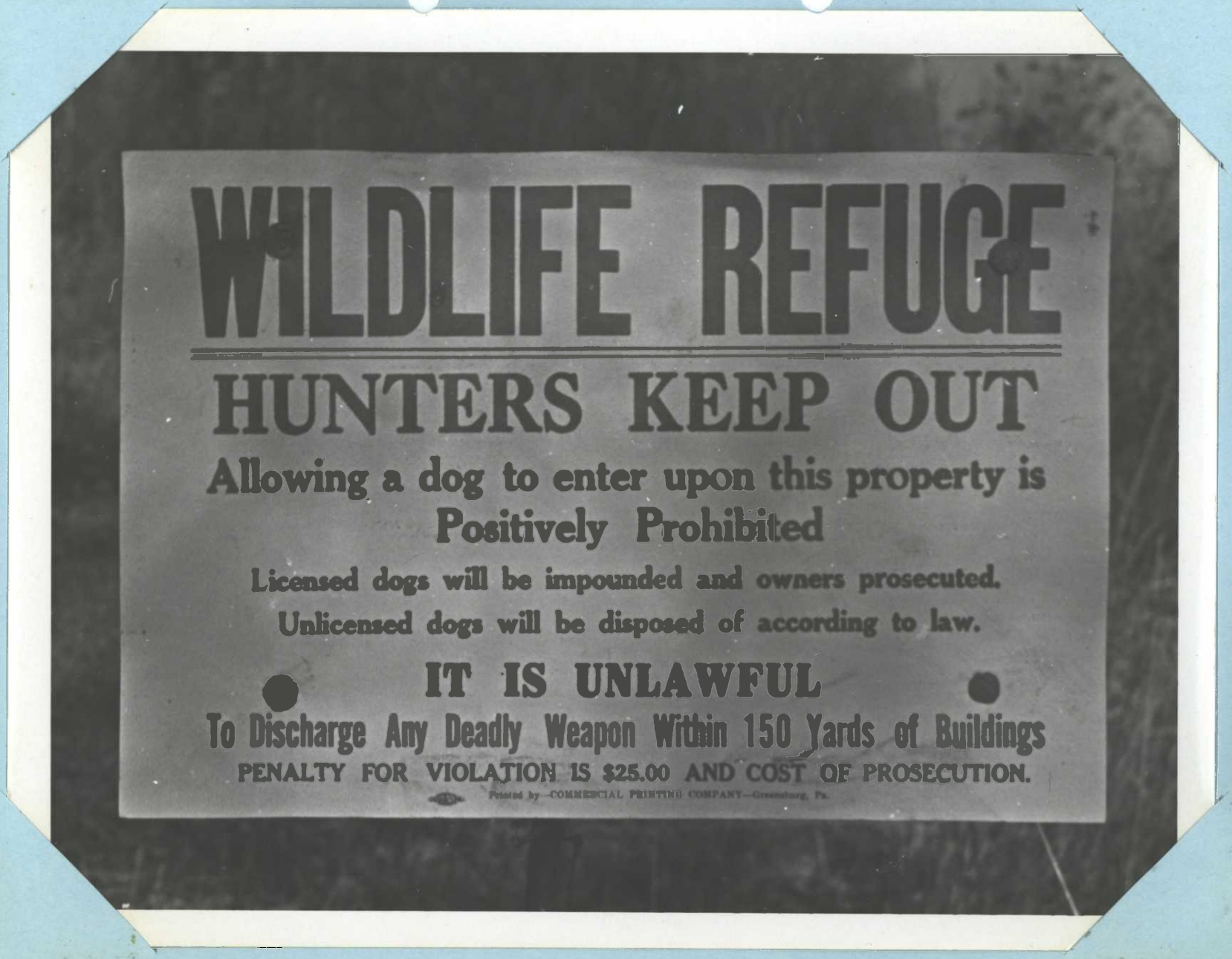
Refuge goose production was about 200 in 1955. A common sight during the early summer.
Photo 55-217; 05-05-55; JRF

Carp fishing in the Ferguson Bayou is the common daily activity during summer and fall months.
Photo 55-378; 09-19-55; JRF

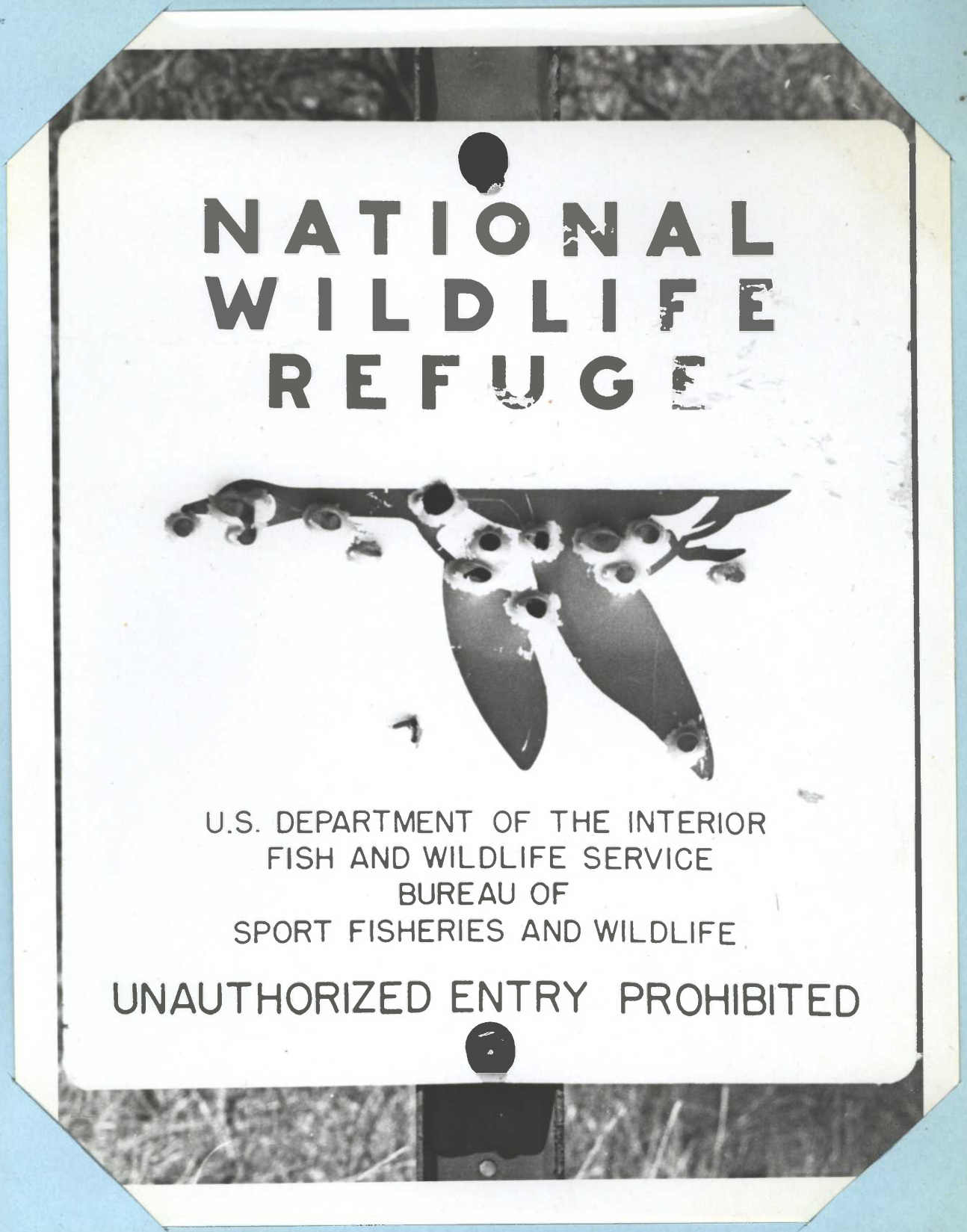
This gander on patrol defending his nest site provided many thrills to school groups. Most City school children have their first wildlife experience during refuge tours.
Photo 55-179; 04-18-55; JRF

Tour activity for various local school groups continued to increase in 1955. City kids have the opportunity to see "Conservation in Action". Photo 55-238; 05-11-55; JRF

Typical view along nature trail developed during 1955. Trail loops about five miles through woods and along the marsh. Photo 55-253; 05-18-55; JRF



Refuge neighbors have their own special boundary markers. This causes some confusion among hunters. Photo 55-452; 11-22-55; JRF



Local sharpshooters continue to find our targets irresistible. The one successful prosecution for sign shooting, in Federal District Court at Bay City, Michigan, carried a sentence of $100.00 fine and two years on probation. Photo 55-208; 05-02-55; JRF

Observation tower mounted on pickup truck for waterfowl census work. Unit folds down flat for road travel.. Photo 55-127; 03-15-55; JRF

Flood damage to Pool 1 low-level dike. Photo 55-177; 04-25-55; JRF

Pool 1 low-level dike after flood damage was repaired. Dike raised and sloped.
Photo 55-273; 05-07-55; JRF

Dike slopes were then seeded to grass cover. The "Hydro-Seeder" applies seed-fertilizer mixture, in water solution, under high pressure. Photo 55-280; 05-07-55; JRF

After seeding, a straw mulch was applied to dike slopes using the power mulcher acquired from surplus property sources. Photo 56-315; 06-22-56; JRF

Completed section of Pool 1A dike after repairs for flood damage. Photo 55-245; 05-02-55; JRF

All nesting islands in Pool 1B were repaired and then seeded to grass and fertilized prior to re-flooding. Photo 55-300; 05-21-55; JRF

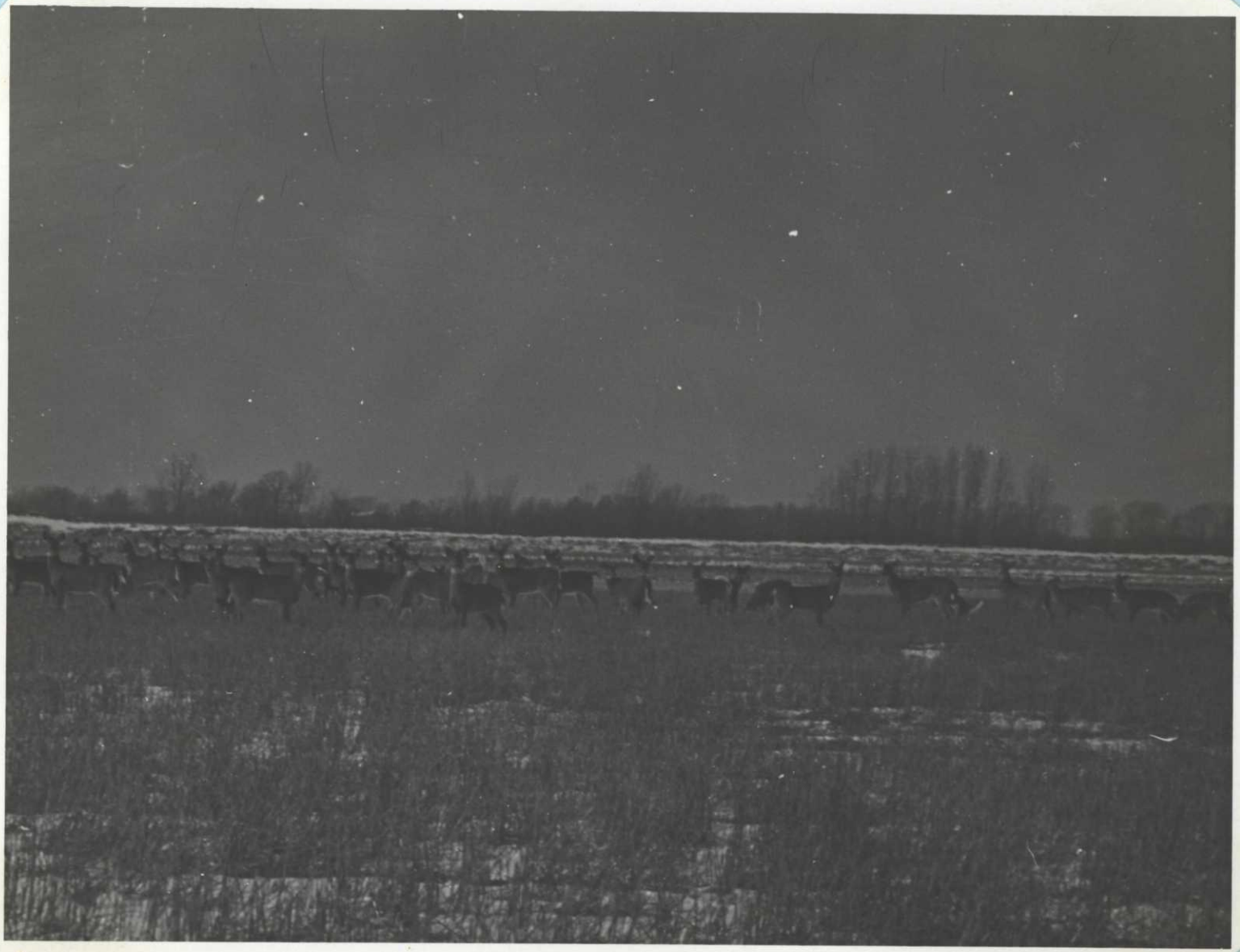
Roadway across Pool 1A spillway with repairs to flood damage underway. Roadbed required levelling and filling. Photo 55-244; 05-25-55; JRF

Completed roadway across Pool 1A spillway with crushed rock in place.
Photo 55-301; 06-21-55; JRF

Boundary fencing was continued along new property lines of Tracts Nos. 172 and 173.
Photo 55-250; 11-22-55; JRF

The narrow bridge over the County Drain into Secondary Headquarters was replaced with a culvert to furnish safe, easy access to the area for heavy equipment.
Photo 55-255; 09-15-55; JRF

Grassy Island, Wyandotte NWR, illustrates the major oil pollution problems found in the Detroit River. Oil collects on aquatic vegetation and forms potential death traps for waterfowl. Photo 56-354; 07-15-56; JRF



Deer concentrate in cropland units during the winter. Photo 55-30; 02-22-55; JRF